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This contract die and tool shop employs only high-grade workmen and favors modern equipment. The interior is painted white, and kept clean. Ample window space is also provided. Individual motor drives are being installed on the machines

Tool Work on Contract

Contract shops that specialize on die and tool work are engineering organizations where general production methods are not readily applicable

By George S. Brady

Associate Editor, American Machinist

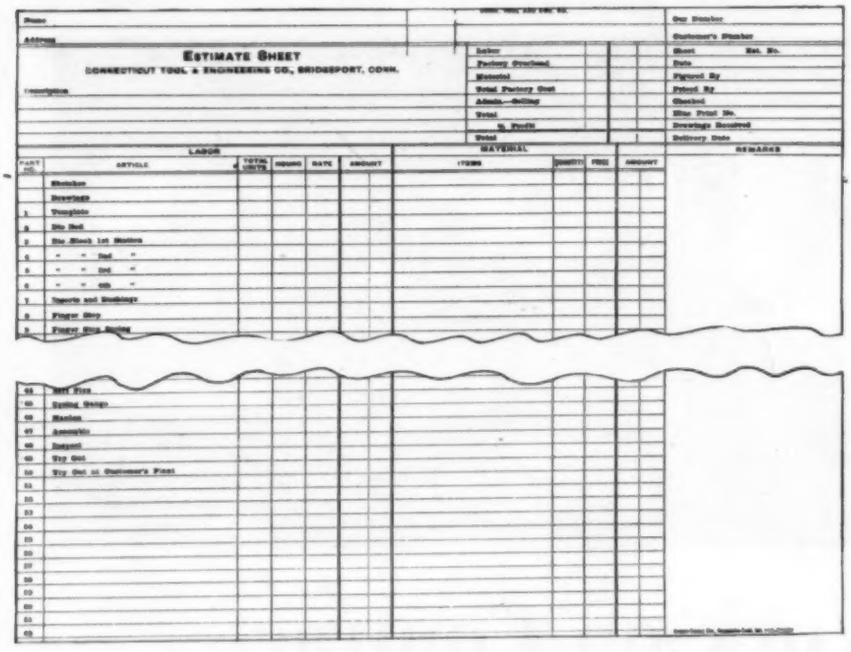
DIE AND TOOL shops are pre-eminently contract shops in the full sense of the term. They are not to be confused with the contract press shop which may employ diemakers and produce tools, but which, in reality, are contractors for the parts made on the tools and thus at least are partly production plants. The contract press shop, when it obtains large or continuous repeat orders, becomes actually a production plant on duplicate manufacture, but the contract die and tool shop does not manufacture an ultimate product, and its work is largely engineering in its nature.

The shop here described, that of the Connecticut Tool & Engineering Company, of Bridgeport, Conn., is typical of the modern type of die and tool contract plant in organization and methods. It is also typical of the successful small shop in its applications of organization and personnel. The shop is housed in a one-story building especially constructed to give ample light and ventilation on all sides. The interior of the shop is painted white for light and cleanliness. The office is located across the front of the building, and is divided into three parts—an office proper for bookkeeping, receiving, and clerical work, a drafting room, and a manager's office. The main office and drafting room open directly into the shop. The plant organization consists of a manager, a tool engineer, a tool designer, a shop foreman, a follow-up clerk, and a stenographer-clerk for office duty. In the shop the majority of the men are highly skilled toolmakers. Some of them are specialists on certain types of work. A man skilled in heat-treating is also employed. There are no apprentices in the shop, but 3 or 4 machine-hands are employed to do the rough machine operations and these men are given better work as they show inclination. As in most small shops there is no formal grading of the workmen, but roughly, they divide themselves into three classes: Machine hands, average toolmakers, and highly-skilled "artists" capable of doing the finest types of die work.

Orders are supervised and cared for by the manager.

They are obtained largely from production plants that do not have enough toolmakers to take care of the making of all of the production tools or that do not care to handle certain especially accurate or difficult tools in their own tool departments. The contract tool work may also be obtained as sub-contracts from small contract production shops making parts for large automobile, radio, or other production plants but not adequately equipped or manned to make all of the tools. In some cases the large plant gives out the tool contract with instructions that the completed tools be turned over to another small contract production shop for the making of the parts, so that the payment is made direct and not as a sub-contract. In still other cases a plant building punch presses or other machine tools and not prepared to make the accessory dies and tools, will contract with the original purchaser of the machines to supply the full equipment for the production job, and will then sub-contract with the contract tool and die shop for the tools. In such a case the press builder sends the machines to the tool shop, where the tools are built in, and the finally completed machines with tools installed are shipped directly from there to the customer. The press builder, of course, in this case, pays for the tools, and not the ultimate buyer.

There seems to be no limit to the geographic radius in which a tool and die shop of this kind can operate. At the present time, chiefly because of the scarcity of high-grade toolmakers and the production pressure on the large plants the Eastern tool contract shops are making tools for the automotive plants of the Middle West and even for plants as far away as the West Coast. The tool contract shops of this kind depend a great deal upon building up a reputation for ingenuity in solving difficult problems, and for producing well-built tools that will give hard service to the customer. The


ESTIMATE SHEET

CONNECTICUT TOOL & ENGINEERING CO., BRIDGEPORT, CONN.

Fig. 1—Advance estimates are made on this form by the tool engineer in order that an intelligent price may be given on the work. Contracts for tools are generally obtained by bid

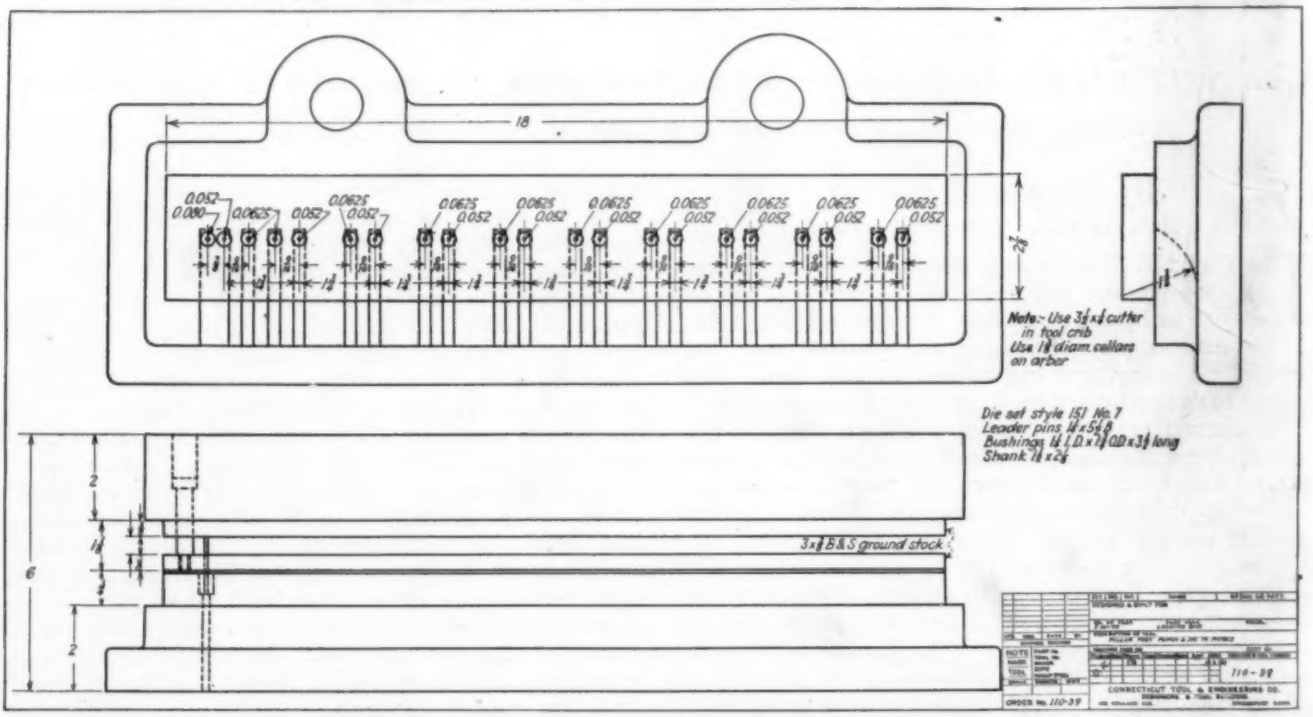
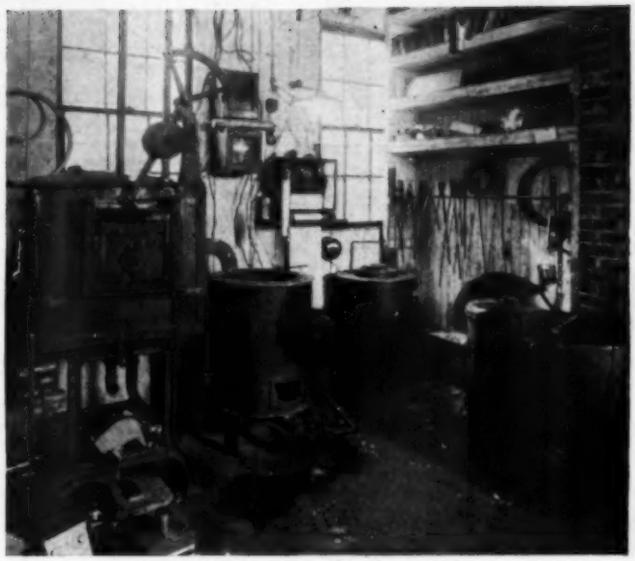

18
Note:- Use 3⅛ x ¼ cutter in tool crib
Use 1⅛ diam. collars on arbor
Die set style 151 No. 7
Leader pins ⅝ x 5¼
Bushings ⅝ I.D. x 1⅛ O.D. x 3⅛ long
Shank 1¼ x 2¼
3 x ⅛ B & S ground stock
110-39
CONNECTICUT TOOL & ENGINEERING CO.

Fig. 2—A typical tool drawing as furnished to the shop by the tool engineer. It is necessary to give only the important dimensions and to outline the proposed tool, since the workmen are all high-grade toolmakers. The drawing is made on tracing paper in pencil. From this tracing blueprints are made

shipping weight and size of the average tools are in reality very small in comparison with their value. The tool contracts are obtained by personal contacts of the manager, by advertising, and through the reputation of the contract shop among manufacturing plants.

There is always an economic point below or above which the amount of work on order should not vary greatly. It is naturally to the advantage of the shop to have as many orders ahead as possible so as to keep its men constantly employed on work selected according to their individual abilities. But too many orders ahead will invariably interfere with delivery dates. In the acceptance of an order it is customary to specify an approximate delivery date which is based on the manager's knowledge of work ahead in the shop, and much of the reputation of the contract shop is based on its ability to adhere to its promised deliveries, especially when dealing with automobile or radio factories getting out personal models. The Connecticut Tool & Engineering Company, which has about 25 mechanics employed, usually keeps a sufficient amount of orders ahead at all times, about two-thirds of which are actually in process in the shop.

When a contract has been arranged, the tool engineer and the manager already, in most cases, have a grasp on the requirements of the job as they have been called into consultation or have prepared the estimate. In fact, all jobs of any size on which a bid has been made are estimated carefully in advance by the tool engineer. The estimate sheet is shown in Fig. 1. It is intended that all items of material and labor will be figured in detail, but



Heat-treating is done in the corner of the shop by a skilled specialist on die and tool work. Standard grades of tool steels are employed, and the recommended heat-treatments are generally followed

ited almost entirely to plant cleaning and repair work.

Orders for tools may be accepted on the basis of customers' tool drawings, or on drawings made by the tool designer under instructions of the tool engineer from customers' part drawings or from the part itself. In the latter cases the contract shop may submit the tool drawings for approval with the cost estimate, or the estimate may be entirely based on a production quantity. Ordinarily, the contract shop does not like to work from sample parts, but prefers the customers' figures on part dimensions in order to avoid dissentions. When tool drawings come from the customer they are usually made in great detail, but when made in the contract shop by the tool designer only the bare outline of the requirements are given on the drawing. It is found in practice in this class of shop that the relatively small number of high-grade toolmakers employed know all of the usual standards for bolting, doweling, clearances, and other points, and that all that is required by them is an accurate dimensioning of the vital parts of the die or tool. It would require at least one additional draftsman to make fully detailed drawings. A typical die drawing is illustrated in Fig. 2. This drawing is made in pencil on heavy tracing paper, from which a blueprint is made for the shop. For accurate work the toolmaker is provided with a template drawing as shown in Fig. 3, with the dimensions given from one side for easy measurement by the toolmaker.

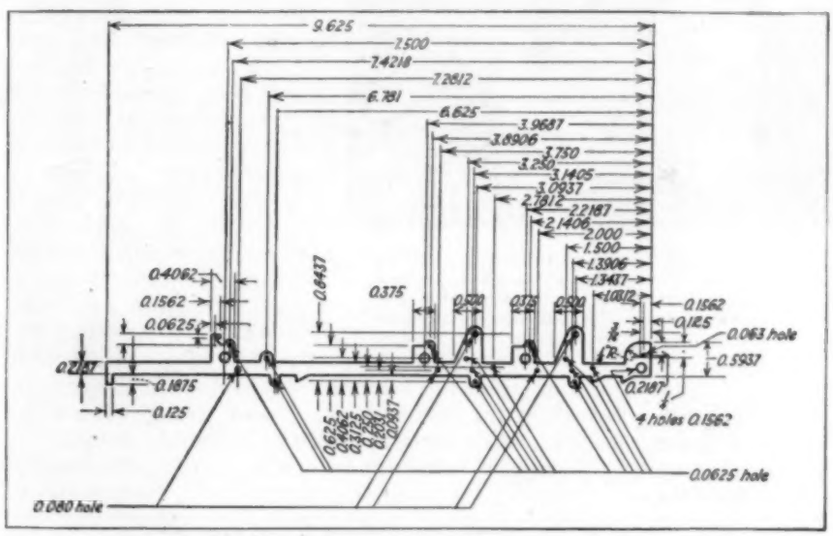


Fig. 3—Diemakers are provided with a sketch such as this one to give all dimensions calculated from definite reference points

in practice the knowledge and personal experience of the tool engineer and manager with similar work enables them to judge the costs without extreme detail. However, everything possible is charged as direct labor or material against the particular job in hand so that the intangible item of overhead is cut down to a minimum. If it is necessary for the tool engineer to visit the plant of the customer, the costs of travel are entered against the job and not carried as general engineering overhead. The only "labor" that is general and enters into overhead is that of the manager, the stenographer, the follow-up man, and the shop maintenance. This latter item is lim-

Standard commercial die-sets, bushings, dowels, springs and screws are employed in all possible cases. The catalogs and standard data sheets of the makers of these parts are kept on file in the drawing room, and paper or metal templates of the die-sets are used for

SHOP ORDER

DESCRIPTION OF JOB

JOB NO.
DATE
SHEET EST. NO.
CHECKED BY
SHIPPED
INVOICE NO.

JOB RECEIVED WORK TO BE COMPLETED BY

ARTICLE MATERIAL

THE ABOVE ARTICLES MUST BE DETAILED ON TIME CARD. MATERIAL MUST ALSO BE ENTERED ON SHOP ORDER AT THE COMPLETION OF JOB.

Fig. 4—A shop order is made out in duplicate on this form for every job going into the shop

quick estimation of size and for easy layout to save drawing time. The type and size of die-set selected is entered on the drawing, as in Fig. 2, and enough of the finished dimensions are given to enable the machine hand to rough out the set for the toolmaker. All drawings are O.K'd by the tool engineer before an estimate is given and before they are sent to the shop, in order to assure co-operation and avoid disputes. Before a job is sent to the shop, the order form, Fig. 4, is made out in duplicate by the follow-up clerk, who is also the materials and shipping clerk and can handle the several functions effectively in this size of plant. The original blue copy of the order goes into the shop with the drawing, and the white duplicate is kept by the foreman. The clerk enters on the shop order all of the material needed for the job, and at the same time makes out a requisition for the material if it is to be purchased outside. Purchase orders are made out in duplicate on a regular purchase order blank by the office clerk. Practically all buying of material is done from local or district warehouses, since the requirements are not large enough to justify buying from the mills. There is, thus, seldom any time factor between the requisition and receipt of the material, and, in some cases, it is ordered by telephone and received the same day. Only the materials clerk (follow-up clerk) and the tool engineer have authority to requisition materials, but certain materials such as dowels, springs, and screws are kept in stock in the shop by the foreman, and, when used, are entered against the job. Standard sizes of die steels are planed ahead in 24-in. lengths and stored in the shop. Drill rod is also stocked in the shop in all of the usual sizes. The foreman has control over these materials. He also controls the small tools used by the workmen. Every two toolmakers are supplied with one complete set of drills, taps, reamers, and counterbores in the commonly used sizes. There is no toolcrib clerk, each toolmaker being required to return any borrowed tools to the toolcrib shelves immediately after using them. The foreman alone controls the cabinet containing the new drills, files and other consumable tools.

The expert die filers, "artists," have separate work benches apart from the machines. The shelves at the right are used for the storage of the small tools used in the shop. All toolmakers have free access to the shelves, but only the foreman has the key to the drill and "consumable" tool cabinet

In the shop the foreman puts the material, the drawing, and one copy of the shop order in a tote box so that the machine hands are able to go ahead with the work and rough out the parts ready for the toolmakers. These tote boxes are kept on a rack in the center of the machine room.

As the work proceeds in the shop, the workmen make out time cards, Fig. 5, for each separate job, stamping their own times. There is no time clerk needed in the shop, since the toolmakers are capable of filling in all required data on the cards and chargng to the proper order number. This information they obtain from the work order in the tote box. These cards are sent regularly to the office clerk who enters the time of each workman on the cost sheet of the job. The cost sheet is shown in Fig. 6. This sheet and the estimate sheet, shown in Fig. 1, are kept in a Kardex file, and a sliding scale shows at a glance the state of progress of the job at all times. The office clerk also keeps a customers' summary sheet showing estimate and final cost on all jobs done for each customer.

The work in the shop is specialized as much as possible, and this is arranged by careful planning on the part of the foreman. For example, after the diemakers take the roughed-out tools from the boxes and lay them out, they are returned for the milling machine hands to mill, after which the diemakers receive them again for finishing. The hardening or heat-treating of the parts is done by one

Connecticut Tool & Engineering Co.

Date	NAME	Job No.

Description of Work				
	A. M.	In		
		Out		
	P. M.	In		
		Out		
			Total Hours	
			Rate	
			Total Wage	

Fig. 5—The workmen make out a job card and record their starting and stopping time for each job handled

specialist in a specially equipped corner of the shop. This heat-treating section has a tool-type electric furnace, a salt-solution drawing furnace, a bench-type gas furnace, and an oil bath. Electric temperature recording instruments are used.

The management of the shop believes in the most modern equipment, and in the elimination of hand work and fitting. The shop equipment includes a die-filing machine and modern toolroom grinders. The shop is now being changed over gradually to direct motor drives on the machines, and the new machines purchased are of this type.

In the handling of the personnel the best standards of the large plants are followed, but with the added advantage that in a small shop of this kind more personal attention can be given to individuals and a high degree of co-operation secured. There is practically no labor turnover in the shop. The personal attention of the management is given to the comfort and welfare of the men, and the standard of pay is kept above the average in order to attract and hold the best workmen. No piece-work or bonus systems are employed, but when a workman or group of workmen does an exceptional job on a contract so that a much larger profit than estimated is made a cash present or share in the extra profit is given. This, however, is determined by the judgment of the management and is not arranged for in advance nor guaranteed. A time clock is used for checking in and out but no harsh or arbitrary methods are employed in "docking" the workmen. When overtime work is required the company pays for the extra meal of the workmen, and they are paid continuous time.

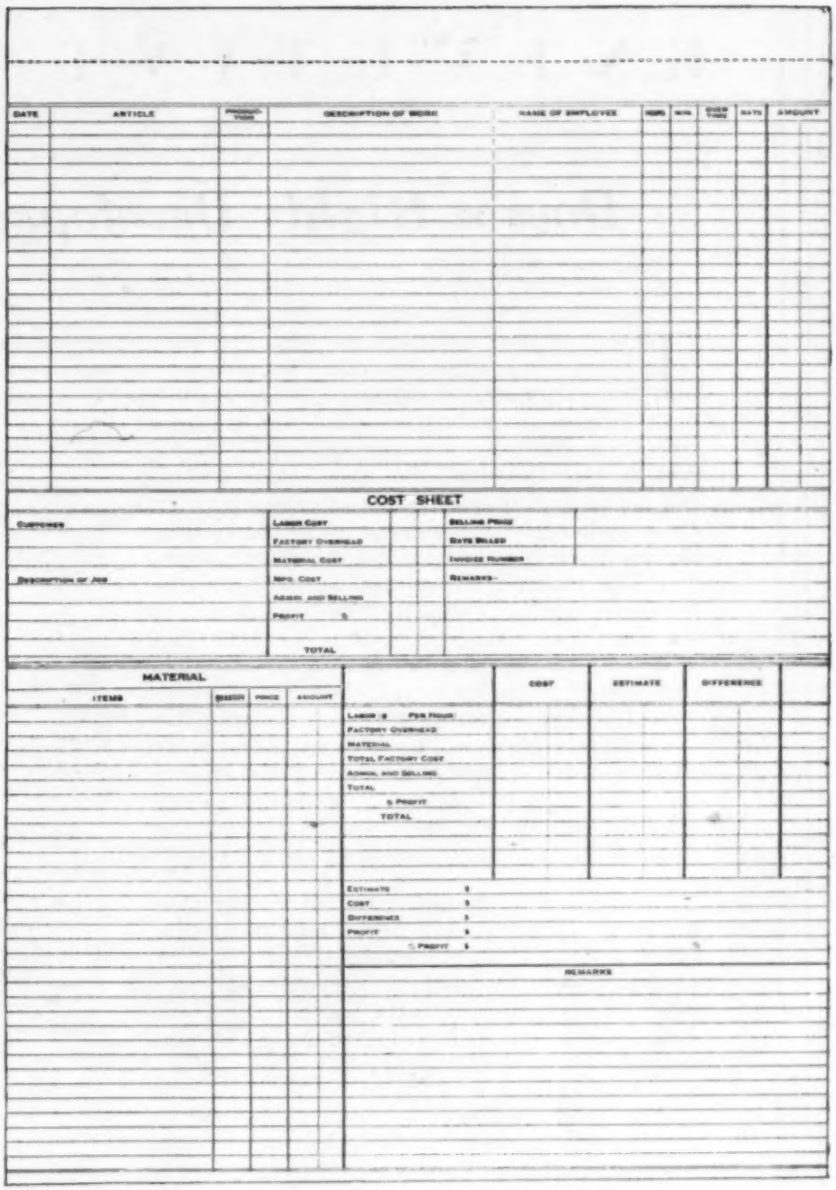


Fig. 6—Form employed by the office clerk for recording the labor, material, and other cost factors in each tool contract

The shop described is typical of high-grade, contract tool and die shops, which, in actuality, are relatively few in number when distinguished from the ordinary, small, contract machine shop that takes occasional tool jobs. The outstanding features of this class of small shop are expert workmen, specialized management, and modern, accurate, and labor-saving toolroom equipment. The small shop is frequently accused of adding nothing to the progress of the modern age of research, but this class of contract shop, with its specialized engineers and workmen who prefer to take in unusual and difficult jobs, unquestionably gives as large a proportion of plant time to development by conference and experiment as the large plant does in the laboratory.

Design, Research, and Materials for the Engineer

NEXT WEEK the monthly Product Engineering number of the *American Machinist* will present for the designer articles by some outstanding authors on timely subjects, including spring design, aircraft metals, and flanged motor mountings. Product planning for the first time will receive undivided attention in these numbers—making for the designer a monthly book of progress in machine design, materials, and parts.

EXECUTIVE · FORUM

Does a Highly Developed System Pay?

THE air was tense in the office of John Hardy, president of the Northwestern Manufacturing Company. A large rush order from an important new customer had been held up so that it was two days behind the promised delivery date, and the buyer when notified had threatened to cancel. A conference between the president, the general manager, Fred Henley, the machine shop superintendent, Robert Mills, and Bill Holland, consulting engineer for the company, had been called in the endeavor to save the day.

Henley was replying to Hardy's inquiry as to the cause of all the trouble. "I have felt all along, John," said he, "that we went too far with this system idea. Because I came up through the shops, I suppose I am prejudiced against records and routine. Direct action, I believe, gets more results than all the cut-and-dried system you can install."

"You speak as though too much system were the cause of our present jam, Fred," responded Hardy. "I'm as much opposed to the 'red tape' kind of system as you are, but you can't run a plant of any real size today without some well established method of procedure for each operation."

"I'd rather let Bob Mills, here, answer you on those points by stating at first-hand how we got into our difficulty," countered Henley. "The tie-up came in his department, and it is only fair that he be allowed to explain the cause."

"Well, Mr. Hardy," spoke up the machine shop superintendent, "it may seem strange that system held up work when it was intended to do the opposite. But regulations and standing orders got in each other's way, and by the time we got the tangle straightened out we had lost the time that has held up our delivery. First, there was a slip on a purchase requisition, then an argument between the receiving and inspection departments, the move gang was unable to move the material until the differences were adjusted, the repair gang routine held up the adjustment of a couple of machines, changes required in the machinist's instruction card for the work caused some more delay, a 'ball-up' in the routing got the job to the wrong machine where it lay for almost a day, and finally a misfiling of the production control slip lost track of it for another day. In this case our men were running the system instead of the job. They got so tangled up in rules and regulations that they forgot all about giving the order special consideration."

"Wasn't anybody watching this job?"

"Yes, Mr. Hardy, but the men didn't feel free to take things into their own hands, or to call attention to the slips in the program, as they did before we put the system into effect."

"Well, Holland," said Hardy, "you've heard the 'ins and outs' of our trouble. As an outsider, you can probably get a perspective view and suggest corrections on the basis of your extensive experience. Our men here are broad-minded enough to realize that we can't know everything, and are ready to accept your advice most kindly."

"Mr. Hardy, I've been through your plant several times to see how your system works, and I am very much impressed with the savings I know you are making because of it. No system is perfect, however, and they all require adjustments when unforeseen circumstances arise.

"There's only one suggestion I have to make. Why not leave the fine details out of the system and open the way for responsible men to act directly in times of emergency? Under normal conditions things will run smoothly on the basis of your general principles of plant operation. In cases like the present, individual initiative will lead men to act quickly and effectively when they are given the opportunity to do their own thinking."

"It sounds as though all you men were in collusion," spoke up Hardy. "But I have good news. This telegram just handed me accepts our two days' delay in delivery, and offers to duplicate the order as of today's date, but only if we will positively get the new order out in the time we originally quoted on the first order. I know we can 'make the grade' but what steps must we take to clear up our trouble?"

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

DISCUSSION

Do Automatic Machines Always Pay?

Several important considerations have confronted our company on this question. When the purchase of an automatic machine is under consideration, it is always well to ascertain definitely that no other machine in the plant will serve just as well by adding certain pieces of equipment to convert it into wider uses. Among the improvements which we have introduced along this line are adding turret heads to engine lathes, equipping grinding machines with special attachments to reduce operating time by devices of an automatic sizing nature, mounting two or more single-spindle drill presses on a common cast-iron bed to convert them to multiple-spindle machines, and interchanging drill presses thus built up into multiples, so that jobs of different natures can be handled.

Machine tool manufacturers now recognize the importance of convertibility of standard machines and are prepared to solve problems of this nature. The expense of converting a machine is confined to a small portion of the cost of a new machine. In addition, the older machine will still be used and will not be consigned to the scrap heap.

Other factors calling for special consideration are whether the change will permit one employee to operate more than one machine, an advantage possessed by automatic machines, whether or not the work is of a highly special nature, and whether the output is sufficiently large to keep the machines busy.

—PAUL S. HECKMAN, *Cost Accountant, American Die & Tool Company.*

Hiring Men from Other Shops

Agreements between business houses to prevent pirating of each other's men seem to be necessary and ethical. Positions open should be advertised, and applicants for these positions considered in the usual way. This plan assures the fairest treatment to all applicants. Of course, answers to such advertisements may still be solicited at the club, a practice that cannot be stopped, anyway.

Agreements between a firm and its best men for definite terms of employment would cut out much of the difficulty that concerns now experience when other companies endeavor to take these men away. Such agreements at times may work hardships upon employees who wish to leave to take advantage of better positions. But the difficulty facing a company in losing a key man at some busy period is usually far more serious than the effect on the individual. A legal tie in the form of an agreement in most cases would solve the problem satisfactorily for both parties.—R. L. HASELGROVE, *Tool Mechanic, Eastman Kodak Co., North Harrow, England.*

Interesting Men in the Job

To the extent that I took men working for me into my confidence, I received wholehearted co-operation from them. I have seen many good men leave positions that paid well, to accept jobs where, instead of being treated merely as production units, they were considered as thinking individuals.

In the matter of suggestions, this difference in treatment stands out with particular prominence. The opportunity to submit suggestions offers one effective way of interesting men in the job. In developing suggestions, men learn to view manufacturing problems from their various angles. They begin to understand the various factors entering into overhead expense, and do not begrudge the management the profits that it makes. Realizing the effect that depreciation, replacement costs, idleness of equipment, and other factors on the manufacturing side, and market fluctuation, competition, and changes in demand on the sales side, have upon the operation of the business, men who are thus interested in the the job give up any hostile feeling they may have toward the management, due to misunderstandings, and endeavor to co-operate in solving the problems facing the particular company.

—WILLIAM SCHIRMER.

Record Cards Tell the Story

The best results are obtained from employees when each worker is made to stand or fall on his own record. If increases in pay and promotion are made on the basis of what the worker has accomplished, he is placed on his mettle to keep quantity and quality at the maximum. When records of employees are kept accurately, the management has a measure of each worker's value and can treat all employees according to their merit.

Records are also of value when in periods of business depression it is necessary to reduce the working force temporarily. Men need not then be laid off indiscriminately, and those can be retained whose records of reliability, attendance, conduct and performance of work are most satisfactory.

Employee records should be posted monthly and sent to the general superintendent's office to be transferred to the master sheet showing the entire record of each worker. Such a file naturally involves work, but, in plants where it is used, it is found well worth the extra time required. —R. G. GRAHAM, *Head Inspector, Advance-Rumely Company.*

Overtime vs. a Longer Working Day

When a manufacturing plant experiences a sudden increase in the demand for its products, at the beginning of the rush period it is generally the best policy to extend the length of the working day. The force of employees can be gradually increased by the addition of a few men at

a time. The newcomers can be assimilated much more easily under such a plan, without disturbance to shop routine and production. The necessity for the longer day should be carefully explained, and workers should be given to understand that it is only a temporary arrangement.

However, if it should be found that more time is required to get out the work, overtime will be necessary. This overtime calls for extra pay in return for the extra effort of the men, and the added cost is a spur to the management to devise ways to overcome the difficulties involved in the situation. Overtime is objectionable to both management and workers. The company must pay a higher cost and the men are called upon to put in longer hours, with a consequent falling off in their physical energy. Hence overtime should be done away with in the plant as soon as possible.

—L. O. BROWN, *Toolroom Foreman, Holcomb & Hoke Manufacturing Company.*

Neglecting Letters Loses an Order

The successful salesman displays a lively enthusiasm in anything in which his customer may be interested, regardless of whether or not it has anything to do with the product he is selling. He knows that by enthusiasm he can win the favor of his customer or prospect, and once this favor is won, he will have more than an even chance against his competitors.

The failure of the Electric Motor Company to pay any attention to Jackson's plans offered its business rivals an opening which they lost no time in seizing. When a firm thinks it has a customer secure, and can neglect to show him even the slightest courtesy, it is leaving the way clear for other concerns that have been watching for an opportunity to take away the business. It is remarkable how far some executives will go to get a new customer, and how little attention they often pay to holding him.

—W. J. OWENS, *Foreman, Newport Rolling Mill Company*

Spending Production Savings on Sales

The sales department of an organization, in order to handle its problems satisfactorily, must do considerable planning. The man in charge of sales must have an intensive knowledge of the goods to be sold, and, in addition, must understand the peculiar financial problems and needs of his particular business, as well as its objectives and future plans. The aim of the sales department should be not merely to increase volume, but also to increase net profits, not to do all the business there is, but to do a paying business.

It frequently happens that goods are sold at a price that yields merely a nominal profit, or no profit at all. There may even be a loss. The distribution of goods through various marketing channels has been given far less attention than the problems connected with production. Routine standardization is more difficult in the distribution field because of the importance of the purely human element. But the opportunities for savings are great. Because of the enormous expense of marketing, as compared with production, any reduction in the cost of distribution will have a marked effect on profits.

—HARRY KAUFMAN, *Public Accountant.*

The economist delights to talk of the law of diminishing returns, applied originally to extractive industries such as agriculture or mining, and to show that it refers also to manufacturing. In the case under discussion the Tractor Company had decreased production costs and increased volume of sales, but made less net profit. The drop in profit resulted from an increase in selling costs. The company therefore seemed to have operated under the law of diminishing returns.

As the consulting engineer, Bill Holland, states, the final result, in dollars and cents, from manufacturing operations may be compared to the answer obtained in solving a problem in mathematics, when you know the true value of all the factors. Meanwhile the economist will have his say. He suggests that if one can sell 10,000 articles at a given price, a 20 per cent reduction in price will result in the sale of many more, say 15,000 and so on.

Had George Greely, the president of the company, in view of the economies he knew could be obtained by a certain increased output, reduced his price accordingly, John Watkins, the sales manager, would not have had to spend more per sale to dispose of the increased output. Quite the reverse would have been true, and this sales economy would have shown up in the bank balance.

—C. NORMAN FLETCHER, *Cheadle Hulme, England.*

A Novel Reward for Shop Improvements

In offering rewards for shop improvements in methods of production, the following basis would seem to be fair: The reward should relate only to the time saved in the shop, it should never have the character of a rent or royalty, it should be awarded only during the run of the particular lot for which the suggestion applies, and it should equal half of the saving made in manufacturing this lot.

If the improvement is applied to succeeding lots of work, no reward need be paid. This limitation seems to be necessary in order that the full savings can be realized to the manufacturer in the shortest possible time, and enable him thereby to reduce the selling price of his product. In this way the employee, the manufacturer, and the buyer all share in the benefits of the suggestion. When shop improvements concern equipment, however, they are probably worth a patent, if it can be secured.

—FRANZ BERMANN, *Supt. Locomotive Factory, Austrian-Hungarian Licensed Railway, Vienna.*

Small Machine Tools

Applied to

Instrument Manufacture

By Frank J. Oliver, Jr.

In miniature machines for the interchangeable manufacture of bearings for watt-hour meters, assembly as well as cutting operations are performed

BECAUSE the lower bearing carries practically all of the thrust load under fairly high unit pressure on account of the small areas involved, its design is radically different from the upper olive bearing, which carries only radial load. This lower bearing assembly consists of a single steel ball which bears on two sapphire cups, one carried in a mounting sleeve pushed on the staff and the other in a carrier of unique form mounted in the instrument frame. Fig. 1 shows the complete assembly.

Extreme care is exercised in selecting only perfect balls for this lower bearing so that it will be practically frictionless. These balls, which are $\frac{1}{8}$ in. in diameter, are bought from a firm specializing in ball manufacture, and when received are carefully polished between oscillating canvas-faced disks for about 8 to 10 hours, using very fine rouge as the polishing medium. At no time are they touched by human hands lest there be rust from moisture; instead wooden tweezers are used. Before being examined the balls are cleaned of any traces of rouge by rubbing them between lawn cloth pads. Each ball is then examined over its entire surface under a 40-power microscope to observe any defects and classify as to cracks, scratches, pits and flat spots. This visual inspection is very rigid and some of the rejections are returned to the polishing machines. The perfect balls are placed in stoppered bottles where they are kept dust-free until required in the assembly.

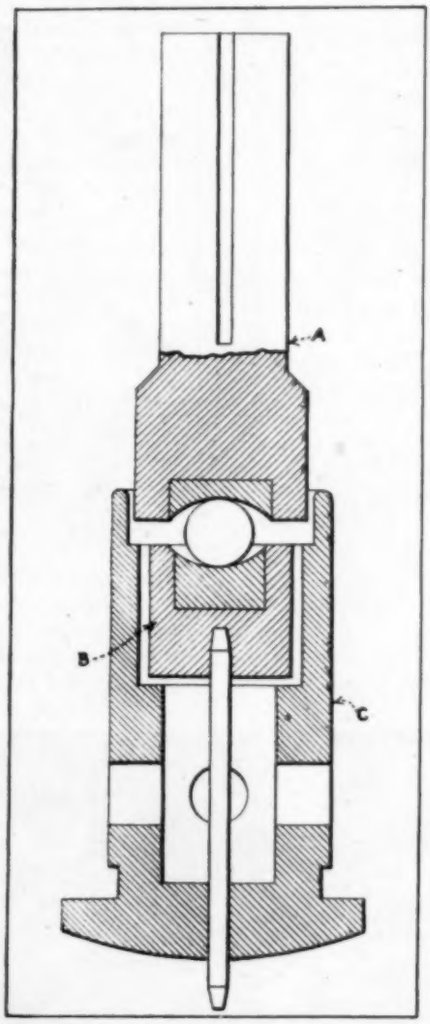


Fig. 6—Five-to-one view of the complete lower jewel bearing of the disk assembly, showing the sapphire cups holding the steel ball

Considerable care is used in examining the sapphire jewel bearings, which likewise are purchased from an outside source. After being counted they are examined under a microscope for defects and as an additional precaution are "felt" with a needle. If the cup is smooth, the needle will quickly gravitate to the center from any position, but if any pits are present the needle point will stick in them. Every jewel is given this needle test, and a portion of them are tested for correct radius of curvature and the depth of cup. The height of the jewel is subject to some variation and it is therefore necessary to select and group the jewels according to height in steps of 0.002 inch.

A number of interesting turning operations are involved in making the aluminum jewel-carrying mount *A*, Fig. 6, the slotted end of which slips over the swaged lower end of the disk staff. This jewel mount is rough turned to the two diameters in a screw machine from rod stock and is then placed in one of the small 6-station turret lathes, being held in a collet chuck by the smaller-diameter shank. First the end is faced, and in the second station the recess for the jewel is rough bored. Final boring to exact size of the jewel is done in the third station using an ingenious device to enable the size of the jewel to control the position of the boring tool and hence the size of the hole. This design is brought out in Figs. 7 and 8. Upon completion of the boring operation the jewel is inserted in the socket by hand, and in the two following operations the metal is spun around it to hold it in place. The first spinning tool is convex, the second concave.

This spinning operation covers a large part of the jewel face with metal which must be cleared away with a hand tool, by aid of a magnifying glass, while the piece is chucked in a speed lathe.

Since the position of the depression in the sapphire

The concluding part of the article.

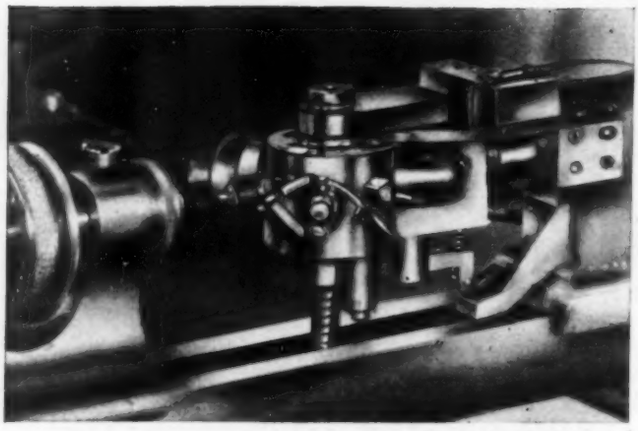


Fig. 7—Arrangement of the boring tool on the turret whereby the jewel gages its own bore in the brass container

varies somewhat in each jewel, the next step is to true the larger outside diameter of the aluminum mount with respect to this depression. This is done in a small jeweler's lathe employing a special floating chuck while allows the jewel to be centered by means of a centering piece in the tail stock. The chuck is then tightened and the cutting tool, carried on an arm pivoted on the tail stock, is swung into position for trimming the outside diameter. Fig. 9 shows the cutter arm swung up out of position.

Inspection for concentricity follows, the sleeve being chucked by this finished diameter and the jewel observed while rotating. A small mirror mounted at 45 deg. and a low-power magnifying glass carried in a brass tube enables the operator to do this. In the following operation the piece is chucked by this finished diameter and the shank end is faced, bored and turned on the ouside diameter. This shank is then slit with a saw to produce a clamping effect on the spindle. Fig. 10 shows the machine used to accomplish this last operation.

After the shank is drilled and slotted, the whole bearing assembly is placed, with others, in a holder and scrubbed with alcohol, then dried on an electric stove. They are now ready for inspections, which include a visual one, under a 60-power microscope, for scratches and cracks in the jewel received during the engraving operation after spinning. Another needle inspection is also given because, with the many color bands in the jewel, it is often difficult to detect pits under the glass. The bore of the shank is also inspected with a plug gage for diameter. Gaging of the distance from the bottom of the shank bore to the lowest point of the jewel depression, together with the distance between this latter point and the top of the mount, is done in automatic machines with hopper feed.

Much the same operations as described above are used to place the lower jewel in its brass mount *B* which, as Fig. 6 shows, is mounted within a brass sleeve *C* that completely surrounds but does not touch it, and that is carried on a small steel wire. The object of this unique construction is to provide a flexible mount to act as a damper for vibrations set up by the alternating current, which would cause noise. The jewel container has a hole drilled into the back and a wire pin is forced into it, just as was done in the case of the wire journal in the upper bearing assembly.

This wire is tested for tightness by holding the jewel mount in a special fixture and pulling the wire with grips. A percentage of the product is checked by a dial gage for height of the brass mount, and a pin gage of special form is used to check the distance between the top of the mount and the lowest point in the jewel. Concentricity of jewel and mount is also inspected. As in the case of the upper jewel, the engraving tool used to clear the metal away from the face of the jewel after the spinning operation may produce scratches so that a visual examination for such scratches is necessary, an eye loop being used. A needle "feel" test is also given.

Brass sleeve *C*, Fig. 6, is completely turned in a screw machine and the next following operation is the drilling of four equally-spaced holes in the lower end. This is done in a small horizontal drill while the work is supported in an indexing fixture, two passes being necessary to produce the two sets of holes at right angles to each other. The next step is to drill the small hole in the head through which the pin shank of the jewel holder is later forced. A light press fit is used so that when the position of the jewel is changed it will hold its new position.

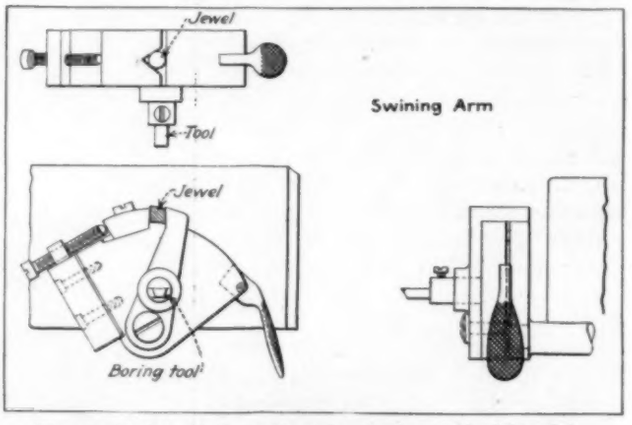


Fig. 8—Sketch of the self-gaging boring tool pictured in Fig. 7, showing details of the construction

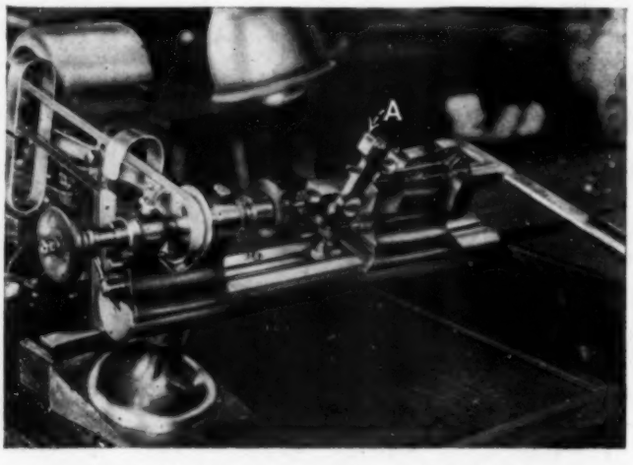


Fig. 9—In this lathe the jewel, in its container, is centered in a floating chuck and the outside diameter is turned concentric by means of the tool *A* shown swung up out of position during the centering operation

After these drilling operations the outside diameter of the brass sleeve is checked between the limits 0.2179 in. No Go and 0.2183 in. Go in ring gages, both being mounted in a small block.

It is necessary that the jewel be placed in a definite relation to the shoulder at the head of the brass

sleeve. In the initial assembly operation, therefore, the jewel container and its wire shank are forced beyond their final position so that a section of the wire about $\frac{1}{16}$ in. long protrudes through the sleeve head.

The whole assembly is then placed in a special fixture incorporating a holding piece for the sleeve, a screw-pressure plate and a dial gage. When the screw is advanced, the jewel, which bears on the pin of the dial gage, can be adjusted to the desired position.

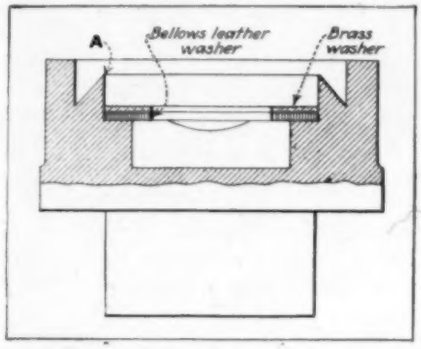


Fig. 11—Cross-section of step bearing carrying the worm thrust on the countershaft in the register train. The leather washer absorbs the shock of the drop press

Clearance is allowed between the outside of the jewel container and the inside of the sleeve so that it may vibrate if necessary, and this clearance must be equalized all around. This is done by bending the wire shank by means of a tool inserted through one of the four holes drilled near the head until there is an equal annular clearance all around by observation. After this centering operation the vertical position of the bearing is checked again for height in case the wire has been bent so far as actually to affect the original height adjustment.

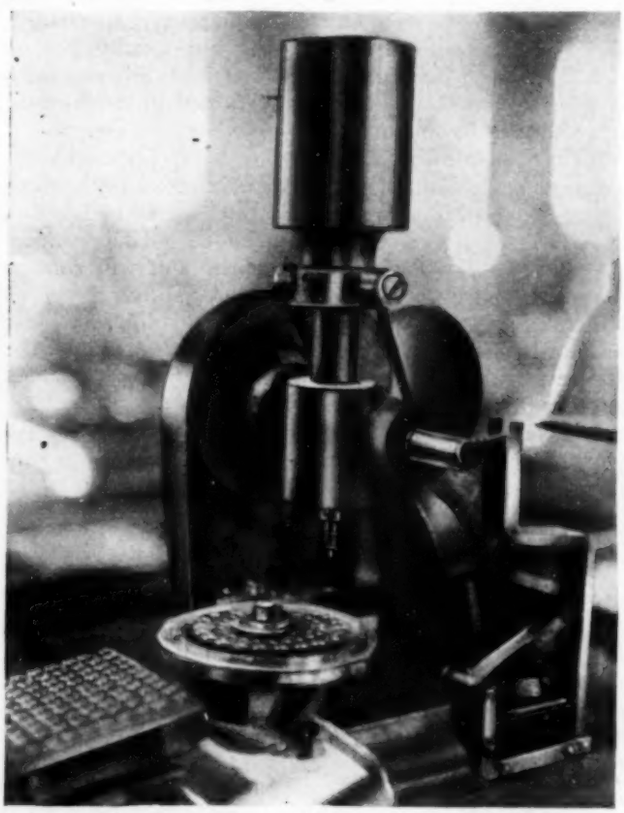


Fig. 12—Small drop press used to assemble the jewel bearing shown in Fig. 11. The dial feed is a safety feature, because while the weight is not large the punch is small in diameter and can easily puncture a fingernail

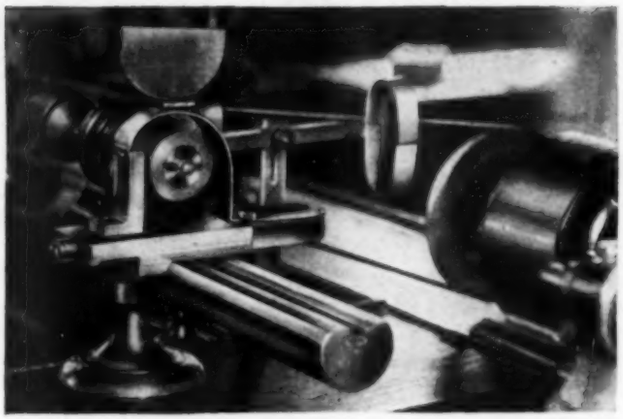


Fig. 10—The shank of the aluminum bearing container is slit on this modified lathe. The saw is carried on the lathe spindle as shown, and the piece is placed in a bushing in the special cross-slide which is returned by spring pressure to the normally free position

When the bearing is finally located in place the wire protruding from the sleeve head is ground off.

Another interesting jewel bearing is the step bearing that carries the worm thrust on the first countershaft in the index gear train. It is shown in Fig. 11, and its construction differs from those just described largely for manufacturing reasons. Final assembly of the jewel in its containing brass shell is done by a small gravity press, and because of the shock a tiny leather washer is placed over the jewel to prevent its destruction. The illustration shows a section of the holder just after it is turned out before the lip *A* is forced over the brass washer placed over the leather washer. Fig. 12 shows the press used in this operation. Two cams elevate the weight used to produce the necessary impact upon the punch. Safety to the operator's fingers is assured by the dial feed. The jewel assemblies are carried in a tray mounted on springs so that the press shock will not disturb the two washers resting loosely on top of the jewel.

The tiny leather washers, 0.008 in. thick, are punched from English bellows leather by means of a small hand punch and a light hammer with even greater rapidity than could be done on a machine, and with little waste.

A number of inspections are necessary in producing this jewel bearing and are similar to those previously described for the jewel bearings of the disk staff. In fact it is obvious that for these particular parts of the watt-hour meter, almost as many inspections as operations are necessary.

To Detect Hot Bearings

By W. F. Schaphorst
Consulting Mechanical Engineer

A SIMPLE way in which to detect a hot bearing is to paint a stripe on the bearing that will change color with an increase in temperature. An engineer writing in a German paper, states that such a paint is readily made from a mixture of mercuric iodide and cuprous iodide. He paints a stripe about an inch wide on the bearing. It is bright red when cold but fades on warming to a temperature that is noticeable to the touch and disappears when the temperature reaches 140 deg. As soon as the color begins to fade, the operator sees the danger signal and has time to correct the difficulty.

Recovery of Waste from Babbitting

By P. J. POTTER
Metallurgist, Federal Mogul Corporation

PRACTICALLY all tin-base babbitt metals used in engine bearings are made to customers' specifications, which are many and varied. The copper ranges from 3 to 8 per cent and the antimony from 4 to 13 per cent; generally, the babbitt with lower copper content will contain from 4 to 8 per cent antimony and that with higher copper will have from 7 to 13 per cent antimony. The allowable lead content varies from 0.20 to 2 per cent. If a solder is used as a bonding material instead of tin, the resulting material in the finished bearing will have a higher lead content, but it would not be enough to bring the lead above specificational limits. Impurities such as iron, arsenic, and bismuth should be determined in the tin before using to insure a uniform and high-grade product. These points must be considered when segregating and grading the waste that comes from the finishing operations on lined bearings.

Because of the extremely rigid nature of most of the specifications for bearing linings, it is necessary to use the purest of materials as a base for all compositions. The problem of handling secondary metals is confined almost entirely to the recovery of drosses, spills and turnings incident to the manufacturing operations. A few grades of salvaged material have compositions that make it possible to determine beforehand where they may be used to greatest advantage; a few may be used after a simple melting followed by analysis, while others require sweating or smelting followed by an extra cleaning operation to bring the finished ingot to the necessary high degree of purity. Some of the methods of handling scrap are as follows:

1. Since the tin used in a tinning operation dissolves an appreciable amount of copper and zinc from the bearings being tinned, it becomes necessary to remove the impure tin periodically and replace it by pure metal. The metal removed from the pots is agitated with steam for the purpose of drossing off the zinc, and the remaining clean tin-copper alloy is used in babbitt mixtures where specificational limits permit of its incorporation. The drosses from this purification are smelted as in grade 6.

2. In connection with tinning and babbitting operations, there are always some spatters and spills of high metallic content. This class of material is swept from around the tin and babbitt kettles and is sweated in an oil-fired reverberatory furnace at a moderately low temperature. The resulting metal is collected in a receiving pot and the traces of zinc are removed as in grade 1. It is then ready for use in babbitt mixtures. The residue from the sweating operation is in the form of dross and is reduced to metal by the smelting process, as described later.

3. Skimmings from kettles are always contaminated with fused tinning flux; they are sweated in a reverberatory furnace and the resulting metal and dross are treated as above.

4. Turnings, punchings, and broachings that are absolutely clean, free from iron, steel, bronze or other contaminations, are returned to the babbitt department and melted in a large kettle. The melt is freed from oxides, iron, and non-metallic inclusions by treating with sulphur and rosin and the accompanying drosses are reserved for smelting. The cleaned melt is immediately analyzed and 50 per cent or more new metal is added in the correct proportions to bring the whole quantity to the desired specification.

It is usually unnecessary to classify the turnings and chips before treating as described, as the heavy dilution with 50 per cent or more new metal will take care of specificational requirements in nearly all instances.

5. Gates and scrap from the die-casting operations are returned to the babbitt department and treated exactly as turnings and chips from lined bearings.

6. Drosses from all kettles and from the sweating furnace are mixed with coal or any other good reducing agent and reduced to metal in a smelting reverberatory. The metal from this furnace is tapped into a large receiving kettle and is refined with steam, sulphur and rosin according to the nature of the individual charge. The slags formed during smelting are usually low in metal and are discarded. They are, however, carefully assayed and when necessary are returned to the furnace for additional reduction.

7. In some finishing operations, it is impossible to remove babbitt without cutting some bronze. Such material is sweated at a low temperature, so as to keep as much bronze as possible in the residue. The resulting babbitt will be rather high in copper and will contain some zinc and lead. The zinc is removed by refining as in paragraph 1 and the lead is reduced by dilution. The residue from the sweating operation is absorbed by the bronze foundry and the drosses from refining are added to other drosses for smelting.

8. From various finishing operations there will always accumulate some mixed bronze and babbitt chips and turnings. As the babbitt particles are in the main larger than the bronze, a separation by double screening is fairly effective. The coarse screen, 6 mesh, removes the heavy babbitt, which is added to class 7. The second screen used is 12 mesh, and the particles held upon it are sweated separately. The resulting metal, after refining for removal of zinc, must be strongly diluted with new metal, as its copper content is high. The remainder of this class and of that which passes the second screen is absorbed by the bronze foundry or sold as occasion or market may determine.

9. Scrap, bronze-back, babbitt-lined bearings are sweated to remove the babbitt. The babbitt obtained is refined and cleaned, then pigged and used where specification permits. The residue bronze is returned to the bronze foundry.

Abstract of a paper entitled "Recovery of Waste from Tin-Base Babbitting Operations," delivered at the Cleveland meeting of the Institute of Metals Division, American Institute of Mining and Metallurgical Engineers, September 9 to 13.

Automatic Methods
Applied to Grinding

By Frank W. Curtis

Many forms of flat surfaces can be finished accurately from the rough by grinding as production jobs if proper consideration to tooling is given

VARIOUS modifications of flat-surface grinding are now available for the finishing of metal and non-metallic parts. These are found with the horizontal and vertical grinders and the double spindle machines arranged to grind two parallel sides of a part at one time. In all cases, however, the design of the fixture is of importance, and like other branches of tool design it must be laid out to suit the requirements of the particular part that it is intended to accommodate.

Accuracy and production requirements are the outstanding factors that determine the class of machine and the type of fixture to use, and each form of flat-surface grinding requires individual treatment.

Several production jobs are shown here to illustrate some of the tooling in use by one company, the Gardner Machine Company, Beloit, Wis., for finishing various flat surfaces.

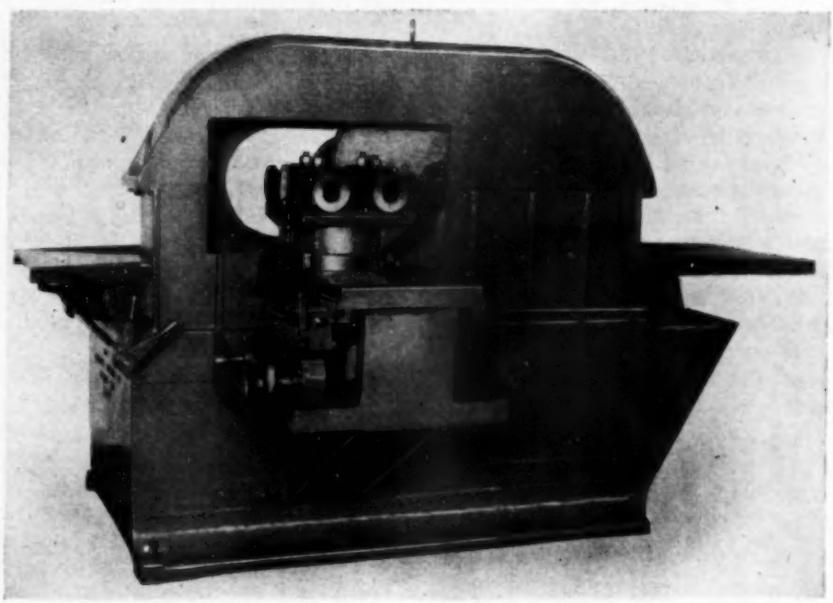


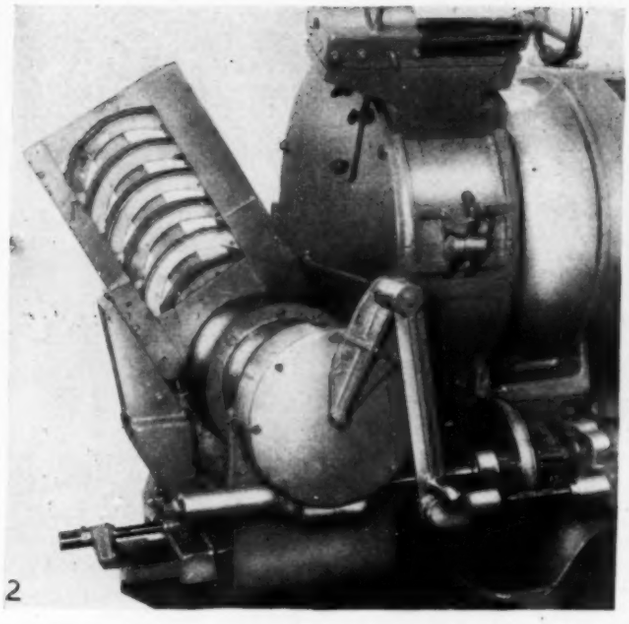
Fig. 1—An indexing table attached to a Gardner flat surface grinder for the grinding of work on one or two side at one setting

An indexing type of fixture for grinding various flat surface parts for refrigerating machinery is illustrated in Fig. 1. Contrary to the usual method of disk grinding, the work in this case remains stationary and the wheel travels in a reciprocating motion. On the front of the machine is mounted a knee which carries a turret slide operated by a hand wheel. In use, the work is brought into contact with the abrasive member, after which the turret slide is fed hydraulically into the abrasive member.

When the work is in the grinding position, the cutting member makes several passes across the areas to be finished, during which time the turret remains stationary, so that the operator can load the opposite side of the fixture. The machine shown is used for finishing 14 different classes of work. For the grinding of faces at right angles to each other, an indexing device is arranged to permit grinding from four sides. The part shown is an end manifold which has two sides and one end ground at one setting. The surfaces are held to within 0.002 in., the removal of stock is approximately $\frac{1}{16}$ in., and the operation is completed in 4 min., floor-to-floor time.

Brake shoes for internal expanding brakes require a finishing operation after the asbestos lining has been applied in order to eliminate entirely the slight inaccuracies that become accumulative during the assembly of the product. The necessity of finishing the outer diameter after assembly has been found essential by most automotive manufacturers, so that brake shoes of uniform proportions can be produced. In some shops the final finish is done by grinding, and an example of such a set up is illustrated in Fig. 2, which shows a Gardner single-spindle machine of the double-ended type arranged to accommodate these parts. The work is fed to the automatic fixture by a magazine feed, so that the only duty of the operator is to keep a sufficient amount of work in the magazine. The fixture has a mechanically-operated clamp that holds the brake shoe as it revolves past the abrasive wheel. After the grinding has been completed, the clamp releases automatically, permitting the brake shoe to pass out at the lower side of the fixture. A similar fixture is located at the other end of the spindle, and the feeding of work at both ends is handled by one operator.

When in use, the fixture rotates at a constant speed and picks up a brake shoe when one of the work-holding sections comes in line with the upper magazine feed. The work drops into the fixture by gravity. As it proceeds towards the abrasive wheel the holding clamp is engaged automatically. The production attained from a set-up of



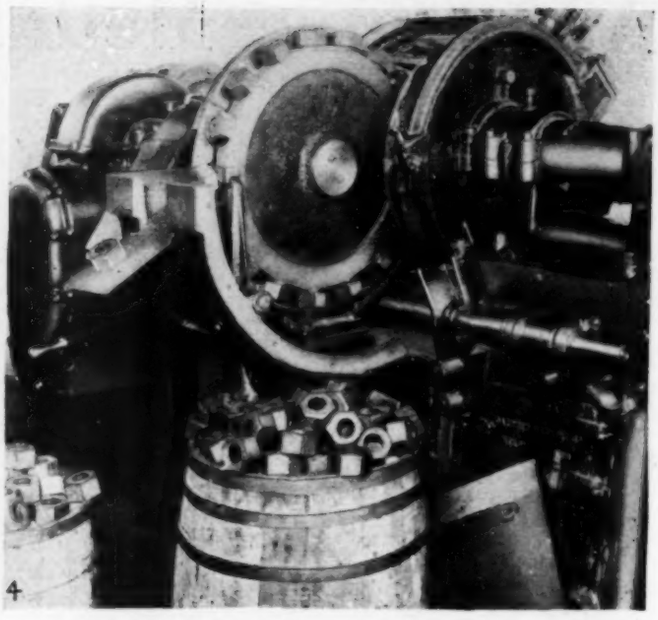


Fig. 2—Grinding brake shoes in a disk grinder equipped with a hopper feed and an automatic fixture that carries the work past the face of an abrasive wheel. Fig. 4—A double-spindle machine arranged with a rotating fixture for grinding the faces of nuts, between parallel faced abrasive wheels

this type varies somewhat according to the size of the brake shoe and the accuracies required, but with the average type of brake shoe a production of from 6 to 8 shoes per minute is obtained from each fixture.

A novel form of holding fixture for grinding the flat surfaces of shock absorber reservoirs is shown in Fig. 3. The fixture is of the rotary type, and is mounted on a 30-in. horizontal grinder. It consists of 6 arms that are pivoted to the fixture frame. A steel disk having 6 U-shaped openings is located at the outer edge of the fixture base, as shown. On each work holding arm is positioned a magnet, the purpose of which is to support the work and to lift it off the table. When the work has reached the grinding position, the supporting arm is

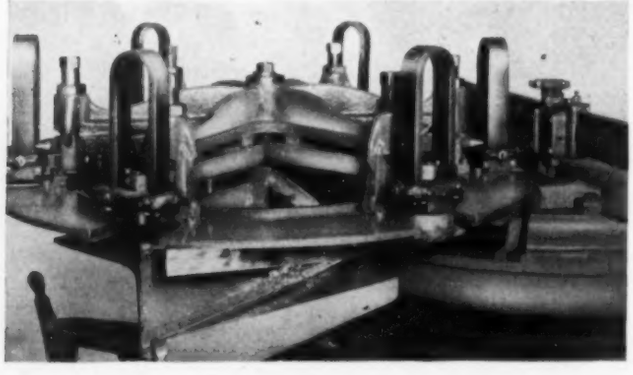


Fig. 3—A fixture equipped with magnets, the purpose of which is to hold the work until it has reached the grinding position

lowered automatically, so that its weight holds the piece firmly against the abrasive disk. The U-shaped opening in the disk acts as a driver for the work to assure its passing uniformly over the abrasive member.

The purpose of the magnets, therefore, is merely to hold the work in place until it reaches the grinding position. This is done because the magnets would not be strong enough to supply the grinding pressure. After a piece has been ground, the magnet supporting arm is raised automatically before the work passes the edge of the abrasive. The magnet raises the work with it. An ejector plate is mounted on the side of the machine which carries the rotating fixture, so that the work will be automatically ejected as it passes this location. The plate is set at an angle, and its action is to force the work off the magnet and into the trough shown at the front. The fixture rotates at 3 r.p.m., which gives a production of 18 pieces per minute.

An example of a fixture used with a double-spindle machine is illustrated in Fig. 4. The operation is the grinding of nuts on six sides. The work is mounted on a rotating fixture which has 17 work-holding plugs. The purpose of having an odd number of work-holding sections is to eject only the finished parts on every third station. The parts must pass between the wheels three times, and on each pass two opposite sides are finished. The ejecting arm shown at the front of the fixture is operated by a cam driven from the machine and is arranged so that the arm trips at every third station. The nuts are turned automatically on the fixture when they pass a spring finger mounted stationary at the front end of the machine. The nuts merely strike the finger and being loose turn 60 deg. Once the work proceeds between the wheels it is restrained from falling off by a guard as shown at the lower side of the fixture. Production on a fixture of this kind varies according to the size of the work being ground, but on the average size of nuts a production of from 10 to 40 per minute is attained.

An automatic type of clamping fixture is illustrated in Fig. 5 as used for grinding the face of shock-absorber body caps. Eight fixtures of similar design are mounted on a drum, which is arranged to pass the face of the abrasive disk. At the right-hand side of the drum may be seen a cam which remains stationary and controls the automatic clamping. At the rear end of the fixture is located a pivoted arm, one end of which has a roller

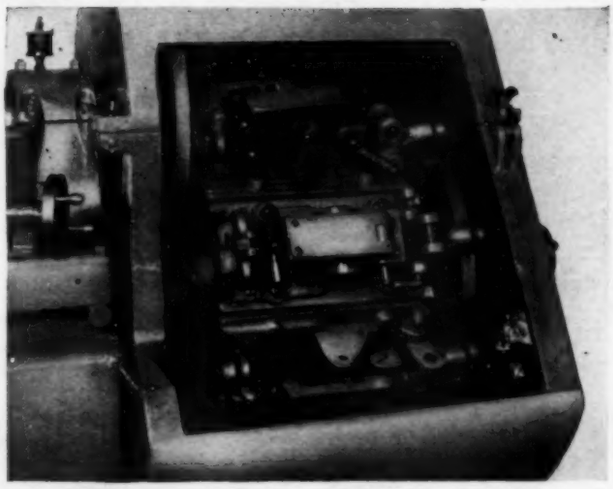


Fig. 5—A drum-type work grinder carriage with eight fixtures, all of which are operated automatically. The set-up is for grinding the flat side of typewriter frame assemblies

that engages the cam, and the other end a toggle joint attached to the heel of the clamp. The loading and unloading position is represented by the fixture shown at the center. As the drum rotates, the roller on the clamping arm comes into contact with the cam and raises the heel of the clamp so that the work is gripped securely as it passes the face of the abrasive wheel. The fixture locates the work from three points, thus allowing a self-aligning or equalizing clamping action to be made. Approximately $\frac{1}{16}$ in. of metal is removed from the face of the work, and to within 0.002 in. of being square. A production of 10 to 12 pieces per minute is attained.

Placing the Worker in the Right Job

By Joseph Bell

IN EVERY machine shop, personnel situations arise which require careful handling. For instance, definite benefits may be gained by transfering men from one department to another. However, the success of the changes is not a matter dependent altogether upon the management. There are some men who "just won't fit" into a new job.

A transfer is often like fitting a peg into the correct hole. If the peg is straight and sound, the endeavor to find a hole into which it will fit is worth while, but if the peg is warped and cannot be straightened, the sooner it is scrapped, the better for all concerned. To devote too much attention in personnel departments to a man who does not succeed because his mental attitude is wrong, is unfair to the rest of the men. Mental attitude and character are the keys to success and too much emphasis cannot be placed on them. If a man is careless, takes an antagonistic attitude, and has objectionable habits, he is a detriment to the organization.

The desire to learn, aggressiveness, and self-reliance are attributes that will eventually win, even though a man may fail completely at some specific task. To aid that man in finding his particular job is of advantage both to the man and to the company, but if a man shows signs of being lazy and indifferent, all the altruism in the world will not salvage him. There are too many men looking for jobs to waste time on such a workman.

SEEN · AND · HEARD

By JOHN R. GODFREY

Speed Is Comparative—Lubrication

SPEED, whether of machine tools or of transportation, is a matter of comparison, and its realization is largely mental. If we hark back to the carbon-steel tool days when 16 to 20 ft. per minute was good cutting speed, we recall that reports of Mushet, Taylor, White, and others on tools cutting 50 ft. a minute were hard to credit. Now we run high-speed steel up to 75 and 125 in many cases, and no one seems to know what new cutting alloys will do when we get machine tools and methods that will get the most out of them.

Switching to transportation, it isn't many years ago when 25 miles an hour was good road speed, and even that got us into difficulty at times with country constables who had ideas of their own on reckless driving speeds. And when the few big cars passed us at 30 or 35 we were sure that something must be done to curb dangerous driving on the highways. Better roads, better cars, and the habit of rapid motion have so changed us that even the average fussy, back-seat driver doesn't begin to get excited much under 45, with 35 and 40 an everyday occurrence.

We chafe at the time taken to reach our destination at 40 miles an hour as much as we used to at 25. And a friend who travels frequently by air tells me that he gets as uneasy at the loss of time at 110 miles an hour as he does at 45 on the ground. All of which wouldn't be so bad if we made good use of the time after we saved it.

* * * *

LUBRICATION may be said to consist of three parts: provision for getting lubricant to the bearings, proper use of the means provided, and proper use of the right kind of a lubricant. Unless all three are provided, bearing trouble and loss of production are always just around the corner. I've seen oil cups plastered all over a machine until it looked like a Christmas tree, and have been told how much care was given to oiling. And then, to the chagrin of the foreman who told me, I've seen many of the oil cups empty, and no one who knew how long since they had been filled.

As to the lubricant itself, few of us seem to know much as to what quality in oil really is. Most of us seem to go on the assumption that if we pay a high price the oil has to be good. This is largely because few of us know much about lubricants, and have been exploited at some time or other by smart oil salesmen. I've seen a man sell the same oil at 9 cents and at 40 cents within fifteen minutes of each other, first as a miner's lamp oil and last as the finest floor oil in existence. I've seen roadside filling stations supply light, heavy, and medium engine oil from the same barrel, and under instructions of the oil man who sold him the barrel.

Yet there is a real difference in oil, and it is only reasonable to expect that really good oil costs more than poor oil. The question is whether we get what we pay for, even after we equip with the best lubricating devices.

Superheater-Unit Repair Equipment

MANY devices of a labor-saving nature are used at the Albuquerque shops of the Atchison, Topeka and Santa Fe Railway System for repairing and testing superheater units.

When an engine is dismantled for repair, the superheater units are removed in a set and transported to the superheater unit repair department. A thorough inspection and test is made of each unit, the necessary repairs are performed, then the entire set is piled according to its location at assembly to await transportation to the erecting shop. A number of devices for repair work are illustrated.

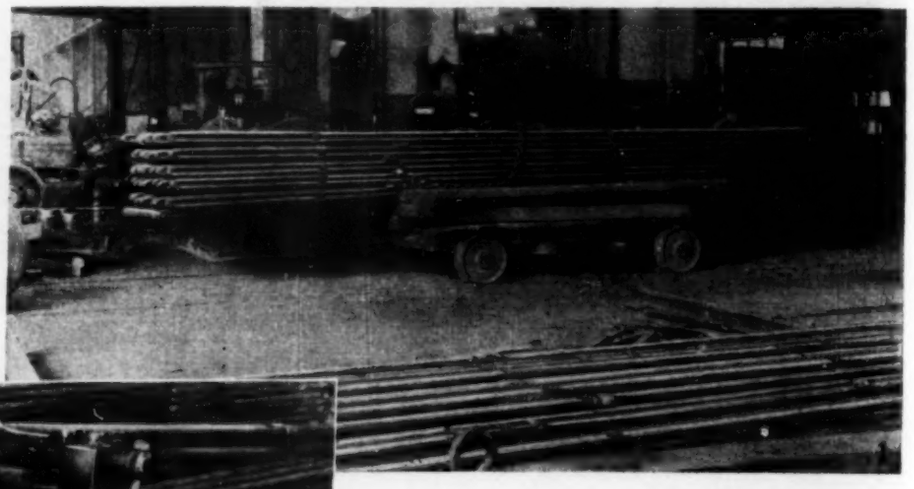


Fig. 1 — Superheater units are transported by means of a convenient form of rack that accommodates an entire set. The rack has an eye located at each corner to which a chain is connected, so that it can be transported by overhead crane. A loaded rack can also be placed on a flat car, as shown, for transferring the work from one bay to another

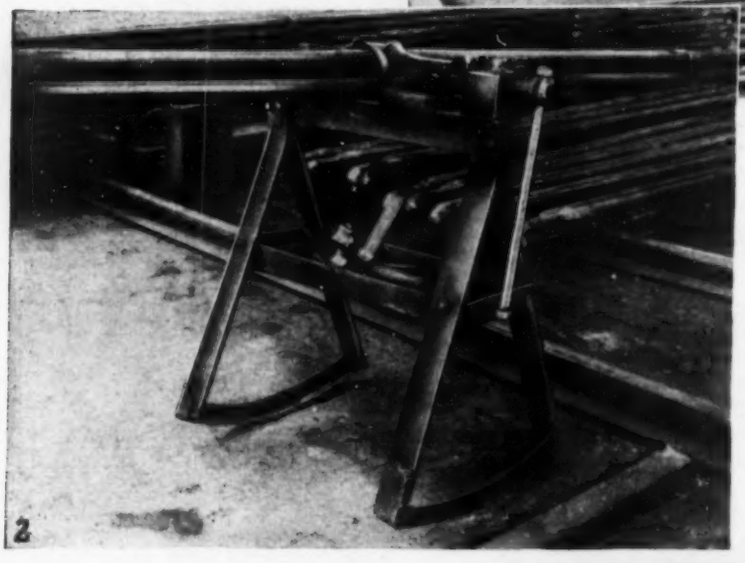


Fig. 2—A stand for riveting bands to superheater units is shown at the left. It is supported on two radial legs in order that it will adjust itself to the slope of the work, as very often the superheater unit rests on the floor at one end. In riveting a band in place, the rivets are put into one end of the band before it is bent over by adjustment of the movable jaw. A built-in shelf is located under the riveting support in which a supply of bands, rivets and tools, such as hammer and bar, are kept

Fig. 3—Showing a straightening fixture for superheater units. It is constructed of a channel iron table, supported by band iron legs. A unit to be straightened is placed on the table and arranged longitudinally so that the adjustable jaw at either end, or both if desired, will strike the section that is warped out of shape

Fig. 4—A near view of the straightening table is illustrated here showing the supports that lie opposite the adjustable jaw. These supports can be moved horizontally so that either a minor bend or badly warped section of a superheater unit can be straightened

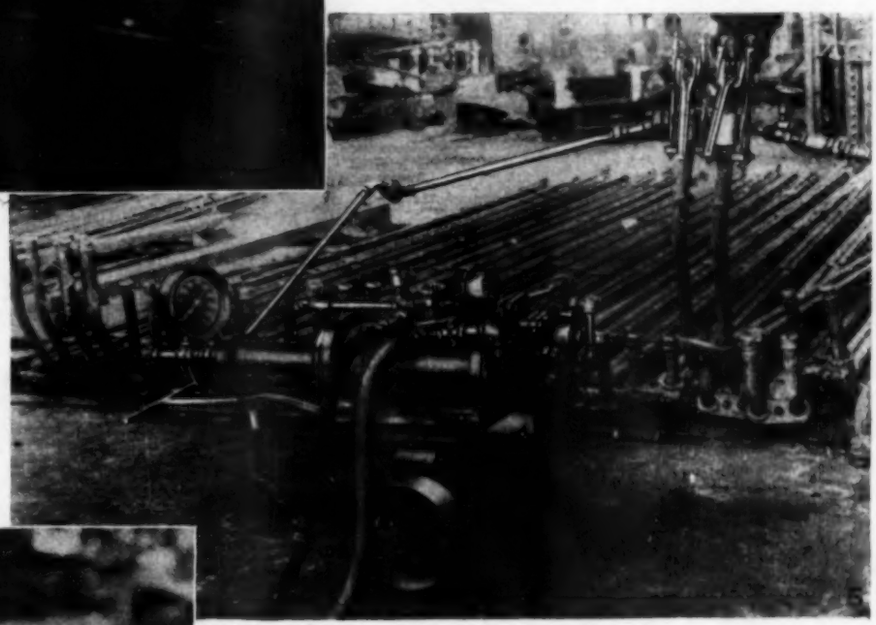


Fig. 5—A hydrostatic testing device for superheater units. The device is operated by a combination of air and water by means of a four-way valve. First, water is admitted to the superheater unit, then the pressure is built up by air to 400 lb. per sq.in. Any leaks at this pressure are easily detected. The device can be applied also to the testing of superheater units within the boiler

Fig. 6—A near view of the clamping device used in connection with the hydrostatic superheater unit tester. Each section of the clamp consists of a vertically-operated seat that fits over the radial seat at the head of the unit, and an eccentric clamped operated by a handle. The clamp is attached to the superheater unit by a U-plate that fits over the unit at the underside of the flange. An adjustment is provided to compensate for the various forms of flanges

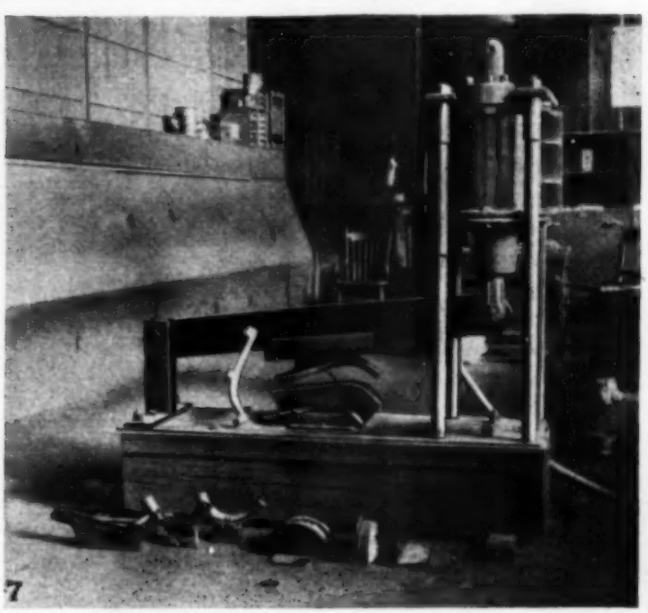


Fig. 7—This air-operated press for forming superheater units consists of a die bed, and a pivoted punch holder attached to an air cylinder. The air cylinder is 14 in. in diameter and has a 10-in. stroke, and the punch bar is 1x6 in. in size. Suitable punches and dies can be used in the press and at the front on the floor may be seen some of the tools used

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been prepared

THE · FOREMAN'S

Learning from the Small Shop

"SAY, Al," greeted Ed, as they met at the lunch counter, "where were you and Williams coming from when I saw you this morning?"

"We were coming home from war, we had just won an important battle."

"Battle! How about all the lectures you give me about not being pugnacious—as you call it?"

"There are times to fight, man, and times not to. Your trouble is that you sometimes get the two mixed."

"Never mind the smoke screen, what were you fighting about—this time?"

"Well, the story runs something like this. Williams is awful keen on getting the order for that big lot of interlocking devices from the Allen people, but he says our price is way out of sight, and he asked me to check over the labor items."

"Were you fighting over piece prices again?"

"No, I found that the tool estimator had called for special cutters and vise jaws for a whole slew of small dogs and latches and levers. I suggested to him that we plane them in long strips and then cut them off, instead of cutting them off first and milling them with formed cutters."

"But Al, using a planer and a hack saw on small parts is not manufacturing, it's small-shop stuff."

"Yes, that's what the estimator said, and he got the engineering department to back him up. They said they would not approve of such 'crude' work."

"Well, I wouldn't go as far as that, but go ahead."

"I told Williams what they said, and he hot-footed it over to the chief engineer, and asked him whether he was supposed to tell the shop what to make, and how to make it, too."

"Yes, but Al, it is small-shop stuff, and besides, a milling cutter cuts all the time, and a planer tool only half the time. I'd be mighty careful what I said if I were you."

"What if it is job-shop stuff, don't forget that when it comes right down to mechanical methods the small shop has most of the big ones backed off the map, because they get results with nothing but brains and what material they can pick up around the shop, and the first thing the big shop does is to yell for special fixtures. Just look at this pawl, for example. You can plane half the formed shape on one side, twenty in a strip, and then by making a simple block to rest on, plane the other side. When that is done cut them apart in jaws with stock saws, disk grind the whole hundred at one time, drill the hole, cyanide the end, and you have them all done before the tool draftsman could make the drawings."

Are we too much inclined to order special tools? What relation should tool cost bear to total labor and material cost? Should the shop be at liberty to use its own methods?

Idea suggested by J. A. Potter, Chief Draftsman, Singer Manufacturing Company

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Games At the Noon Hour

OUR superintendent reads his *American Machinist* carefully. This morning he called me over to look at the article on page 320, Vol. 71. In our small plant we have a softball game every day at noon—that is, every day there are enough energetic souls around to make it worth while. The firm stands the bats and the balls, and there is no other equipment.

"Well, John," he said finally, "personally I think it's a good thing. I know that it certainly gets me in much closer touch with the boys to rubber around a little at noon even if I do get my clothes dirty now and then. I get to know them far better than I would any other way."

"Well, I think so too," I had to admit. "Take the man grinding on that double stone. Things don't always go like they should. He gets fed up, down in the mouth and feeling like throwing things around and using bad language. Noon comes around, he gets out and gives a couple of the boys a good run after one of his 'flies,' gets all the grouch out of his system, and when he goes back to work at 1 o'clock, why he just ticks them off like a regular fellow."

"I don't know just how it would work out in a larger shop," said the superintendent, apparently thinking of our home office, where they have a real sized plant. "Well, I know down home, some of those fellows have no more ambition to start work at 1 o'clock than a jack rabbit. You know yourself that it takes half an hour to get started after a nap."

So that is the way it seems to us. Will someone else tell us about the big shop? —G. K. KENYON.
E. C. Atkins Company, Hamilton, Ont.

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Oil Cups or Force Feed

WHEREVER positive mechanical functions can be substituted for any other type of operation, they should be adopted. This principle should be applied to lubrication, which is always required where frictional surfaces are in contact. The present tendency in machine-tool design towards higher speeds and interdependence of complicated mechanisms demand a constant supply of lubricant as a vital necessity. Where mechanical means of insuring a regular supply can be installed, it is incumbent upon the machine-tool maker to do so. Where cup lubricators are in use, the responsibility of maintaining an adequate supply of lubricant should be placed upon a regular oiler. My own experience as foreman of a battery of automatics proved this by having fewer shut-downs from improper lubrication than under the old system where each operator oiled his own machine.
—H. BROWN, *Doncaster, England.*

DIFFERENCE of opinion about various systems of oiling is best illustrated by the automobile, with which we are all more or less familiar. While many motor car builders, to some extent, place reliance in oil cups and squirt cans, every engine has some sort of pump for the lubrication of its parts.

When we consider the lubrication of machinery, sight oilers are undoubtedly a great improvement over either the open or the covered oil hole. Yet, there is still a chance for question as to whether the oil gets to the bearings in sufficient quantities. When the lubricating medium is forced into the oil passage under pressure from a pump or gun, there can be no doubt that it reaches its destination.

The men in the shop are hired primarily to get out the work and not to nurse the machines. Besides, the average man is apt to neglect oiling that requires the us of oil cups and squirt cans.

When the size of the shop justifies the expense, the oiling should be in the hands of men who are responsible for nothing else. In this case they should be equipped with guns and pumps for the oiling of all machines which do not have a self-contained system for this purpose. The operator is then left free to devote his energies to the purpose for which he was hired.
—L. O. BROWN, *Toolroom Foreman, Holcomb & Hoke Manufacturing Company.*

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The Man Who Shows Interest

I THINK that Ed is wrong in trying to discourage a new man from visiting other departments during lunch hour. From the beginning of time, man has been reaching out in an effort to increase his knowledge and to help his fellow man. After a progressive man has mastered one job, he is usually not content until he has tackled and conquered the next one. For this reason, as Al said, he should be encouraged in his study of the various departments. A man so inclined will no doubt be a future foreman or executive. Many shops have an apprentice system that strives to develop interest in different departments. Under this plan, men are regularly transferred from one place to another in order to learn the various kinds of work. The wide awake apprentices soon surpass their fellow workmen in knowledge, and gain the respect of their superiors, as well as fit themselves for future foremanship or executive duties. —RALPH N. STRYKER, *Tool Designer, Elliott Company.*

AL IS right in suggesting the advisability of encouraging a new man to study the work of the entire plant, but I believe that this encouragement should be limited to the man who shows a real eagerness to study, and it should be given in such a manner that the employee will not ask for special favors in order to study the work. After he has watched the machining

operations throughout the plant, he should be allowed to go into the assembly department, where the different units that he has seen machined are put together.

The importance of such encouragement cannot be overestimated in the inspection department. The inspector who knows the different operations and where each unit belongs in the finished product, is worth considerably more than the man who, because of lack of practical knowledge, cannot give due consideration to the relative importance of the component parts. — R. G. GRAHAM, *Head Inspector, Advance Rumely Company, Battle Creek Plant.*

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Radio in the Shop

IN YEARS past, during the world's series baseball games, many of our employees would remain away from work during the afternoons of the games and gather around a newspaper bulletin board to watch the score. This practice resulted in a curtailment of production, and as the factory was running at full pressure at that time of the year, we had to find a way to overcome this deficiency. One of our foremen conceived the idea of installing a radio set and a loud speaker in each department, and, as we were manufacturing them, it was an easy matter to carry out this plan.

When the hour arrived for the starting of the game, the loud speakers were switched on, and with each man remaining at his machine and performing his task in an orderly fashion, very little time was lost, and our production schedule was maintained at normal.

We then tried putting on radio concerts between the hours of ten to twelve in the morning, and from one to four in the afternoon, for a period of three months. We study the effect closely and found that after a certain period of time, production began to wane.

We found that where some of the employees were able to concentrate upon their work, the majority of them were attracted by the speaking of the announcers, and would lose valuable time during the intermissions; others would spoil some of their work. Where the work was such that the men were working through habit alone, better results were obtained.

—F. A. J. SCHMIDT, *Industrial Engineer, Western Electric Company, Kearney Works.*

Stirring Up the Foremen on Accidents

SAFETY is essential to the welfare of the organization as well as to the welfare of the individual. Yet, I cannot help but feel that Williams chose the wrong time to intensify his campaign against accidents. Just after an accident all the men are inclined to be a little nervous and to hold back.

So I think Williams should have waited until the excitement had cooled down about Jack Hart's accident before stirring up the foremen. It's better to forget about an accident immediately after it has happened and get back to normal before starting a campaign for accident prevention. It is dangerous to keep men who have just witnessed or heard about an accident constantly reminded about it. The time when they have gotten over their tension, usually a matter of several days, is soon enough to start the campaign.

—ERNEST E. LAIB.

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Al and Ed Agree on Obsolescence

I AGREE that it is better to figure out the actual savings that can be made by a new machine before it is installed. From these figures we can estimate how long the machine will take to pay for itself, and also when it will rank as obsolescent equipment irrespective of its condition. These records should be filed under a card index system in the master mechanic's office, and submitted to the management when the age of obsolescence has been reached. Since such records, if properly kept up, are conclusive proofs of the profits on the investments, it becomes an easy task for the master mechanic to obtain further appropriation for new machines. I believe it is because of the absence of such proofs that so many machines are allowed to fall into such a state that they eat into the profit side of the business. —C. L. HENRY, *Nottingham, England.*

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THE · NEXT · TOPIC

"More Ways Than One"

Ed and Al Agree on Obsolescence

SUMMARY OF THE DISCUSSION

The two foremen agreed that worn out machinery is a liability. Ed had a whole line of machines that clearly came under that classification. However, Williams asked Ed to submit estimates on possible savings with new machines. Ed thought it unnecessary, but Al suspected that Williams wanted to impress Ed with the possibilities and establish a basis of comparison for actual savings.

IT WAS agreed that the practice of replacing old or obsolete machines is sound economy. It was the general opinion, however, that this should not be done without figuring out in advance the savings possible with the proposed new machines.

It was held that this estimate should form the basis of comparison with the actual results obtained later, and be submitted to the executive who approved the order, as a justification for its purchase. Such a procedure would also act as a brake on undue haste in declaring any machine obsolete.

An industrial engineer of a large corporation stated that his company maintained records of machine output as a routine, and considered any machine obsolete when a new one appeared on the market that could produce more or better work. The claims of the manufacturers, however, must be demonstrated under actual working conditions. It was occasionally found that the old machine, rebuilt or modified, could be made equal or superior to the new.

New Automotive Products

at the

National Metal Show

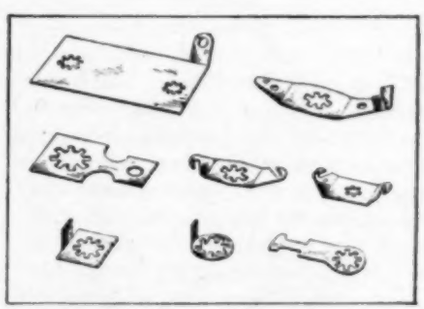
By Herbert Chase
Associate Editor, American Machinist

High-chromium alloys are replacing chromium-plated metals. Gears, shafts, and yokes are being nitrided

MANY new automotive materials and recently-developed products of manufacture had their first public showing at the recent National Metal Exposition in Cleveland. Steels naturally took first place in this exhibit, but non-ferrous metals appeared in many important displays.

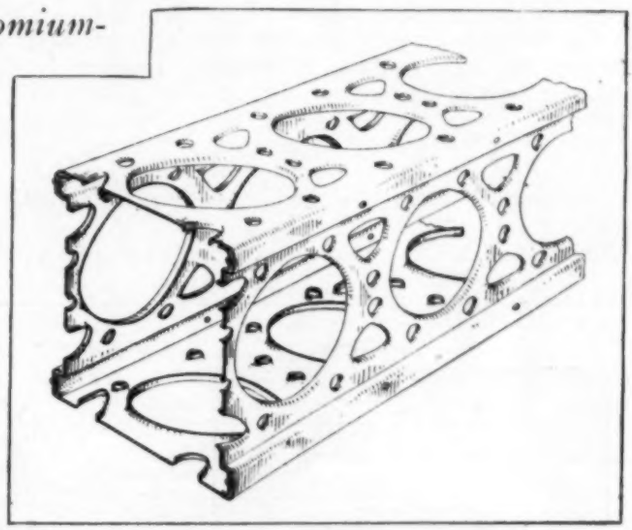
High-chromium steel and iron came in for most attention. These products, including, of course, the well-known stainless steels, are finding increasing use in the automotive field. In not a few cases, parts made from high-chromium sheet and strip stock are replacing chromium plated parts, especially for non-corrosive external trim on passenger vehicles. One maker of this class of material reports shipping monthly considerably more than a million pounds of such strip stock alone to Detroit automotive manufacturers, and finds the demand increasing rapidly also in automotive plants located elsewhere.

Even cars in the lowest price range are using, or shortly will use, up to 2½ pounds per car of high-chromium products, chiefly for trim. Other makers, in the higher price groups, use up to 15 pounds per car, while in intermediate priced cars many pounds of ferro-chromium alloys commonly are employed for each vehicle. A number of comparatively new automotive uses have been found for these alloys. They are employed for radiator shells; running-board and other moldings; door-handles and other body hardware; radiator, gasoline tank and wire wheel caps; wheel hubs; bumper strips and escutcheons; hood hinges; head lamps and other lamp parts; windshield frames; helically-wound flexible tubing; and a variety of other parts in which freedom from corrosion and adaptability for polished trim are important.



Some of the integral parts in which the principle used in Shakeproof lock washers has been incorporated

In cases where a fairly heavy section is required, and in which, for this reason, a high-chromium alloy would prove unduly expensive, a process termed "capping" is being employed, especially with the ductile high-chromium iron produced by the Rustless Iron Corporation of America under the name Defirust. This process consists in forming sheet stock of the capping material from 0.012 to 0.025 in. thick over a radiator cap, rounded bolt head, wire-wheel hub cap, bumper escutcheon, door handle or similar part, and turning the edge back in such a way that it is hidden when the part is in place. The sheet metal can be pressed into indentations of the base stamping if desired, to form almost any relief design.



Section of a Duralumin girder designed for use in the Goodyear Zeppelin, shown by the Aluminum Company of America

This process makes it possible, in certain cases, to use an ordinary carbon-steel stamping or screw machine part, sometimes cadmium plated, for the base member, where brass, chromium plated, formerly was employed. In one such case the cost reduction per car for a set of six wire-wheel hub caps is reported to have been about two dollars. Although the color of the polished chromium-iron may differ somewhat from that of polished chromium plate, the difference is scarcely noticeable, while the non-corrosive covering is many times thicker and is not subject to the defects or service failures that sometimes mar a plated surface.

Although at present the use of high-chromium steel and iron in automotive applications is largely for decorative parts that are given a high polish, these alloys are used also for some structural members, especially pump

shafts and parts for wire wheels. One maker exhibited a wire wheel in which the spokes, hub, and rim were made from alloys of this class. While such a wheel is more expensive at present than one formed from carbon-steel and chromium plated, it possesses the advantage of being made from a non-corrosive metal which takes and holds a high polish that cannot chip. Protection against rust extends, of course, into the spoke joints where plating is likely to be ineffective.

At present the chief factor militating against wider automotive use of chromium-iron alloys is high cost of the metal itself. This cost is being reduced, however, and already has reached a moderate figure where the tonnage is considerable. It is available in sheets, even as thin as 0.005 in. or less, as well as in strips, plates, rounds, flats, wire, tubes and other forms.

Of at least equal potential importance for automotive uses are the steels termed "Nitraloy" designed for hardening by the patented nitriding process. They are offered at present by the Ludlum Steel Company and by the Central Alloy Steel Corporation and already are in at least experimental use by several American automotive factories including a number of General Motors plants.

Among the exhibits which attracted a great deal of attention was a Hispano-Suiza automobile chassis in which the following parts had been nitrided: steel cylinders, crankshaft, timing gears, water-pump shaft, valve tappets, camshaft, oil pump gears, ignition drive shaft and screws, clutch shaft and disks; transmission shaft, gears and shifter yokes; and speedometer gears. Nitrided ring gears and New Departure ball bearing races were among the automotive parts exhibited by the steel companies which produce Nitraloy steels.

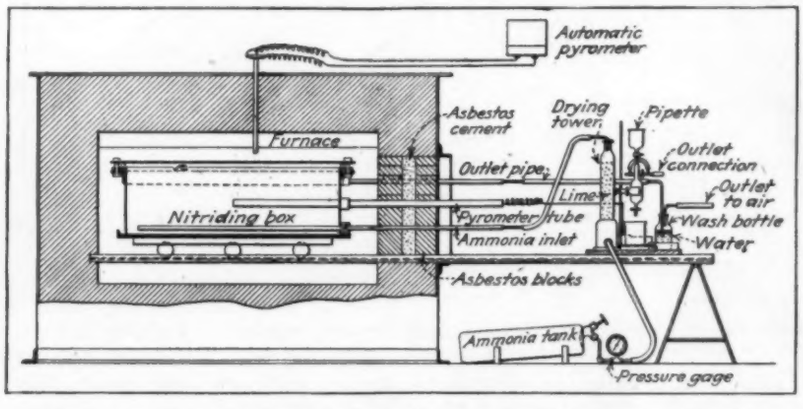


Diagram of furnace and box designed for use in nitriding parts of Nitraloy steel prepared by the Ludlum Steel Company

A number of engineers who attended the show made an inspection trip to the Central Alloy Steel plant in Canton, where a recent design of nitriding furnace is in process of construction. This furnace, which is among the largest built thus far in this country, is equipped with electric heating elements. The nitriding box is some 30 in. square in transverse section and about seven feet in length. Hence it can accommodate parts of large dimensions.

The case produced by nitriding is not alone extremely hard, but is said to be as resistant to corrosion as the best stainless steels. For these reasons, properly treated Nitraloy is reported to give excellent results on such parts as pump shafts, where inferior lubrication and water otherwise are likely to result in corrosion or rapid wear or both.

In common with other metal products, however, notable advances have been made in automotive iron castings, nickel and chromium being the primary alloying elements. A comparatively new alloy, containing both these metals and termed Wear-Loy, now is being cast by the Frank Foundries Corporation in the form of brake drums, particularly for bus and truck applications. These castings, which are made from an alloy similar to one long used for Knight engine sleeves, are said to be more resistant to wear than forged steel brake drums.

Among the non-ferrous materials recently developed is the No. 132 alloy of the Aluminum Company of America. This is a piston alloy with a lower coefficient of heat expansion and a higher heat conductivity than other piston alloys made by this company, and is reported to permit of clearances enough closer to prevent piston slap. The new alloy contains about 14 per cent of silicon, and considerably smaller quantities of copper, nickel, magnesium and iron. Its use admittedly presents a difficult machining problem, but this has been solved, in the Reo Motor Car plant, by employing Carboloy tools. Final finish is by grinding.

Another item of automotive interest in the Aluminum Company's exhibit was a new form of box-type Duralumin girder designed for use in the Goodyear Zeppelin. This girder is built up from strip stock and riveted together, as shown in an accompanying cut. Where portions are cut away by stamping an inwardly turned flange is left around the holes to add strength and stiffness. The net results is a very light and stiff girder capable of rapid production at moderate cost.

Several new forms of lock washers, made from both ferrous and non-ferrous materials, were shown by the Shakeproof Lock Washer Company Division of the Illinois Tool Works. These small parts, widely used by automotive and other manufacturers, now are being made not only in separate form, but integral with many small parts such as electrical clips and terminals. This practice eliminates the need for using a separate lock washer and results also in economies in assembling.

Although the Elkonite exhibit did not contain any new materials for automotive use, some of the welded automotive parts displayed would prove a revelation to a designer not familiar with recent resistance welding practice in which Elkonite dies are employed. Such welding no longer is confined to rough parts which require considerable labor in finishing, but is employed extensively for the fabrication of assemblies which require little if any machine work thereafter. The torque tube used in the Model-A Ford car is a good example. Forgings used at each end of this assembly formerly required considerable machine work after welding to the tube. Today these forgings are machined completely prior to welding and so precise has this operation become that variations in the length of the finished assembly, which is fully three feet long, are readily held within 0.020 inch. This naturally results in important savings in manufacture, since it obviously is much easier to machine the forged end-pieces completely before welding, than to chuck and finish after assembly.

Welding Copper and High-Copper Alloys

By Ira T. Hook

Testing Engineer, American Brass Company

COMPARATIVELY little has been written on welding copper or its alloys, in spite of increasing demand for this element because of its utility, its economy over long periods, and its artistic beauty. If the question of first cost is put aside, the reason for this lack is probably because, in the first place, copper, with its extraordinarily high heat conductivity, offers inherent difficulties to the welder and he is prone to seek other metals easier to manipulate. Secondly, nearly all the copper that is sold as such is electrolytic or Lake copper carrying small percentages of cuprous oxide, which cuts down the welded strength to 50 per cent of that of the dead soft material. Finally, pure copper has but a modest strength, and it is only within the past three or four years that high-copper alloys with excellent welding characteristics, combined with equally good strength, have been made available.

While copper resists atmospheric oxidization to a marked degree, it will take up considerable amounts of oxygen when in the molten state. In the copper refineries, most of this oxygen is removed during the process of "poling" the molten copper in the reverberatory furnace. Copper cast from such a furnace constitutes by far the larger part of the copper of the industries. It is known as "tough pitch" copper, or more frequently as electrolytic copper. The small amount of oxygen in the copper in the form of cuprous oxide is beneficial when the copper is to be used for electrical purposes, cold worked, or cast into shape, but it is quite detrimental from the standpoint of the welder. The welder either must allow for the weakening effect of the cuprous oxide by a suitable increase in the contact area or he must use an oxygen-free copper. The latter is available as a standard product of nearly all of the manufacturers of copper bars, sheets, and tubes, being sold under the general name "Deoxidized copper."

Another property which offers even greater difficulty to the welder than the content of cuprous oxide, is the high rate at which heat will flow through copper. There is no easy way to overcome this handicap in welding. Precautions can be taken to conserve the heat in the metal by covering the surface with asbestos, but a larger input of heat must be used than is the case with steel or cast iron. Also, owing to the extremely rapid transfer of heat through the copper, it is necessary to have the metal back from the weld at a much higher temperature than it must be with the ferrous metals. A preheating is often necessary to fulfill this condition.

The difficulty encountered in securing a strong bond with electrolytic copper points to the use of an oxygen-free copper. This can be obtained readily by remelting the electrolytic copper and adding a deoxidizer in amounts sufficient to react with all of the oxygen. For most purposes, an excess of the deoxidizer does no harm and is decidedly beneficial to the welder, but where the electrical conductivity is a requirement, extreme care must be exercised.

A great deal of time and effort has been wasted in trying to overcome the difficulties encountered in the welding of copper by the use of various alloys. It is desirable, of course, for the welder to use a welding rod stronger than the base metal. It is a reflection on his judgment if failures are constantly occurring in the deposited metal. However, an adequate strength is obtained by using a phosphor bronze, a silicon copper, silicon-manganese copper or, if a difference in color is allowable, a lower melting yellow bronze, brazing spelter, or silver solder.

Where we have manganese and nickel soluble in copper in all proportions, and silicon, cadmium, aluminum, phosphorus, tin, and zinc soluble in proportions of from 1 per cent to 10 per cent, or more, we can have an indefinitely large number of alloys. This is true, even if we exclude the tin and zinc and restrict the alloying metals to a maximum of 4 per cent.

Results of welding tests made up to the present time do not represent the maximum values that can be obtained with any one method of welding, since the man making the welds could not be kept on any one method long enough to develop a technique which would give maximum results. The results, however, do show quite conclusively several things:

1. It is practicable to weld electrolytic copper with the oxy-acetylene torch, the carbon arc, or the metal arc. With the latter method, a certain amount of preheating is necessary to start the weld.

2. Provision must be made by way of increasing the contact area in order to develop the full strength of the base metal. This can be done with the "Shear V," the "wide angle," or the reinforced weld.

3. A resistance butt weld seems to develop nearly full strength. The cuprous oxide is distributed so finely as to lower the strength from that of dead soft copper only slightly.

4. Following the general principle that the best of two satisfactory welds is that one made with the least heat, we would select the Tobin or manganese bronze rods first, wherever it was permissible to use a high-zinc mixture. Where it is necessary to use the arc, the yellow bronzes are unsatisfactory and the silicon-manganese copper seems to offer the best characteristics for a welding rod.

5. Though the tensile tests do not disclose the correct value of the welding method in making sound welds, the writer watched these tests very closly and is convinced that the use of the oxy-acetylene torch and the

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carbon arc are much more reliable in producing welds free of blowholes than is the metal arc.

As in the case of the electrolytic copper, results on deoxidized copper are not the maximum results possible, but are sufficiently representative to enable us to draw definite conclusions, thus:

1. The phosphorus deoxidized, the silicon deoxidized, and the silico-manganese deoxidized coppers are all welded with nearly equal facility.

2. With a given welding rod, the full strength of the deoxidized copper can be developed without resorting to a reinforcing bead.

3. The highest strength of joint is developed using a high-zinc yellow bronze. With this welding rod, the base metal need not be fused. The 3 per cent Si, 1 per cent Mn, remainder Cu, welding rod can also be applied without fusion of the base metal.

4. The oxy-acetylene torch and the carbon arc both give good welds. The metal arc is possible but the resulting welds are more porous than with the first named methods and a certain amount of initial preheating is necessary.

With the advent of the silico-manganese copper and silicide hardening copper, we have available two alloys which have much higher cast strength than electrolytic or deoxidized copper and which can be used in the same thickness ordinarily specified for steel. They can also be work-hardened to much higher strength than copper, and their welding characteristics are decidedly better than those of copper. The welding characteristics have been more thoroughly worked out in the case of the silicon manganese copper than in the case of the nickel silicon copper.

From a series of tests to determine procedure with the oxy-acetylene welding torch, it seems safe to conclude that the oxidizing flame is the economical one to use. The reason for this is that we get a much greater concentration of heat than with the neutral flame, while at the same time the excess oxygen does no harm as it would with steel or bronze. The molten metal is protected by a thin coating of silica glass which spreads evenly over the metal in an impervious layer. As the metal cools and shrinks, a high compressive stress is put in this thin blanket of silicon and it flakes off with some violence, leaving a smooth-surfaced head.

To the welder familiar with the flowing properties of low-carbon steel, this silicon-manganese copper would seem to flow marvelously free. Under the torch or the arc, it flows like water, and will lie quiet under its protecting sheet of silica even in the full blaze of the electric arc. It has, however, one weakness which must be guarded against—it is hot short in the recrystallizing-temperature range just below its melting point. Thus, as the metal cools down from the molten to the solid state, precautions must be taken to avoid tensile stresses. Also, since selective freezing is a function of time, we should hasten the cooling through this range as much as possible. The advantage of a high concentration of heat over as small an area as possible is at once apparent. The same precautions should be taken in the welding of the nickel-silicon copper alloy. For a similar reason the seam should be completely welded in one pass. A second pass is followed by a crack and the weld is worthless. If it be necessary to go over a seam the second time, it can be accomplished without danger by preheating the sheet on either side of the seam just ahead of the electrode.

In oxy-acetylene welding of steel with silicon-manganese copper rod, unless precautions are taken to break up the silicate coating between the added metal and the steel base, the bond will be of low strength and the added metal will fail in adherence to the steel. Where the added metal is deposited quickly, however, as with the metal arc or on thin sheet steel with the oxy-acetylene torch, an excellent strength is obtained.

A workable procedure control is necessary to insure sound welds, and this scheme involves a careful supervision of the four indispensable features: men, materials, methods, and inspection. It is a difficult matter to lay down an accurate procedure control that will apply equally well to a plumbing concern which is interested principally in welding pipe; a sheet metal shop using 14- to 26-ounce metal, a boiler shop using thicker and heavier sheet, or a foundry specializing in castings. However, there are general principles, as follows:

MEN. Expert welders are essential to the successful welding of high-copper alloys. To be expert with the copper alloys, the welder should be experienced with the oxy-acetylene torch, the metal arc, and the carbon arc. He should know what method to use on a given job and what flux to use, as well as what welding rod to use and how to use it.

MATERIALS. The base materials are usually determined on the basis of cost, desirability on account of its physical or electrical properties, and similar factors, and neither the welder nor the welding supervisor has much to say about it.

In the case of the welding rod or the deposited metal, the welder should have more to say. He should, in the case of the high-copper alloys, use a rod that will weld avidly with the base metal at the lowest heat to yield the desired strength and resist corrosion or change under the conditions that the assembly is to be used.

The welding rods which are most appropriate for high-copper alloy base metals are as follows:

1. HIGH-STRENGTH YELLOW BRONZES. This class includes Tobin Bronze, manganese bronze, and similar compositions sold under various trade names. These welding rods melt at the lowest temperature of any rods above the silver solder class. In no case is it necessary to fuse the base metal. These rods should be given first consideration as they have a higher strength than the base metal and use a lower amount of heat. They would be ruled out: (a) where the electric arc is to be used, (b) where the difference in color is objectionable, and (c) where exposed to an open flame or immersed in acid solutions, and used with a high-copper base metal.

2. DEOXIDIZED COPPER. These rods can be used with any method of welding. A fusion weld is the result, having the strength of dead soft copper only. The rod should carry sufficient deoxidizer to react with the oxygen during the deposition. Silicon is the best all-around deoxidizer for welding.

3. HARDENED COPPER. The writer is in favor of adding more of the deoxidizer as an alloying element and obtaining thereby thorough deoxidization, greater strength, lower melting point, and better welding characteristics generally. For this purpose the alloy carrying 3 per cent silicon, 1 per cent manganese, and 96 per cent copper is recommended, but as is shown in the foregoing, other similar alloys can be employed.

METHODS. Little can be said concerning the proper welding procedure except as it applies to a given job.

INSPECTION. All welds should be tested perfodically.

IDEAS FROM PRACTICAL MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Relief Attachment for Cold-Heading Bolts

By Fred R. Daniels
Waterbury Farrel Foundry & Machine Company

THE process of cold-heading bolt blanks is a comparatively simple one, and the tools with which the heading machine is equipped are usually equally simple in design. Bolts of the ordinary type are generally cold-headed in a solid-die machine, a double-blow header being required in most cases. In the parlance of the bolt industry, the volume of metal in the head is defined as so many diameters of the stock from which the bolt is made. The accepted rule, under normal conditions, is 2½ diameters for single-stroke headers, 4½ for double-stroke headers and eight for triple-stroke headers.

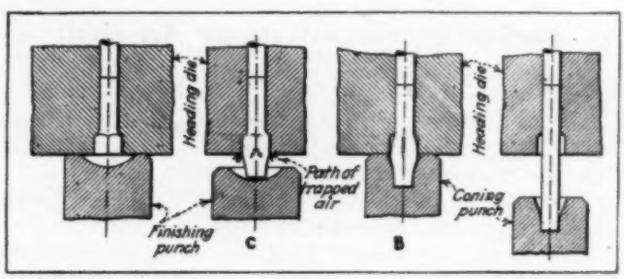


Fig. 1—Sketches showing successive steps in the heading of a bolt blank in which a square shape is upset beneath the head in two strokes

The blank is pushed into the hole of a plain cylindrical die by the first punch, the heading thrust being taken by an adjustable backing-screw at the rear of the knock-out lever. After the final punch has completed the upset, the knock-out lever swings forward, ejecting the headed blank from the die. For bolts having shoulders, squares or other shapes under the heads, it is necessary to apply an automatic shifting-stop in back of the knock-out lever, so that the stop will be receded to take the thrust of the second blow. Such an attachment is illustrated and described in this article.

The first, or coning, punch of a bolt header, is so designed that the first blow struck will produce a bulge, approximately barrel-shaped, starting in the die recess, as shown at *B*, Fig. 1, and extending beyond the face of the die. The bulge will not fill the corners of the die recess completely, and cannot be subsequently made to do so, except by the aid of a relief attachment.

By simply receding the knock-out lever stop after the first blow has been struck, the bulge will be forced hard into the corners of the die recess by the second punch as it advances, as *C* shows. This is the function of the relief attachment, the construction of which will be described in a later paragraph.

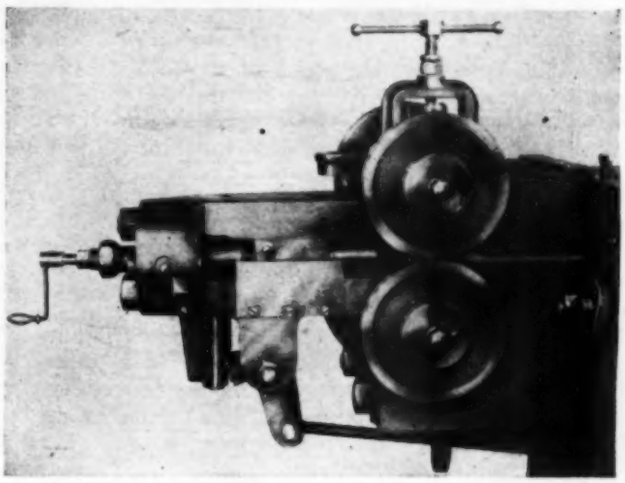


Fig. 2—Relief attachment applied to a bolt-heading machine of standard type

The relief attachment is applied to the roll-feed frame of the header, as illustrated in Fig. 2. The construction of the device is shown in Fig. 3, to which reference should be made in following the description. The end of the knock-out lever, which is a standard header-part, is shown at *A*. When pushed back, it bears against the end of extension rod *B*, which has its bearing in the feed frame. This rod abuts against a cylindrical boss on the rectangular slide *C*, the longitudinal position of which is set to suit the length of the blank by means of the adjusting screw *D*, and is locked in the slide by the

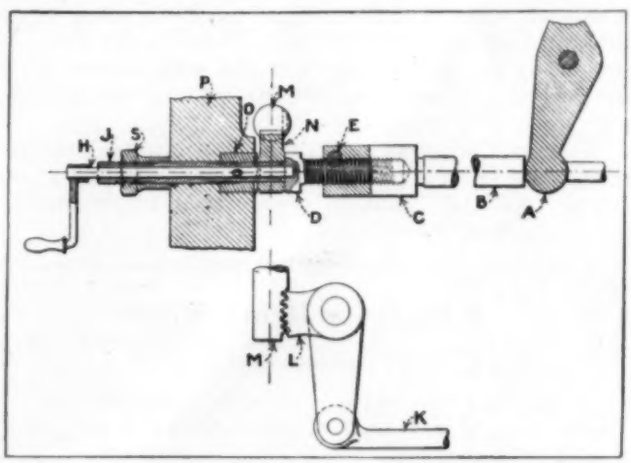


Fig. 3—Conventional section-assembly of the relief attachment, showing its construction and operation

drawbolt *E*. Screw *D* is turned in the slide by the long socket-wrench *H* when making the adjustment. The wrench extends through the hollow, relief adjusting-screw *J* into screw *D*, as shown.

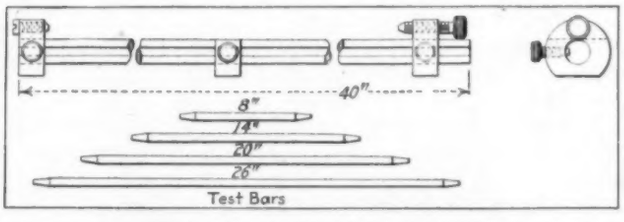
The receding, or relief, motion is derived from a rockshaft on the header, through rod *K* and the gear segment *L*. The segment operates the vertical rack *M* having other teeth at its upper end at a right angle to those with which the segment meshes. The teeth at the upper end of the rack mesh with the segment pinion *N* having clutch teeth in its hub. The mating clutch member *O* is fastened in the frame *P* of the attachment. The segment pinion *N* is free to turn on screw *J*, and is oscillated thereon by the action of the rack, so that its oscillating movement combined with the intermittent end-heading thrust, through slide *C*, causes the clutch to alternately engage and disengage in synchronism with the two strokes of the header.

Comparator for Inside Micrometers

By George C. Warren

In our work we use inside micrometers of 8, 14, 20 and 26-in. base sizes, respectively. As it is necessary to inspect the micrometers at regular intervals, and having no outside micrometers with which to do the work, we made the comparator shown in the illustration.

The bed *A* is a piece of ¾-in. drill rod to which three



Comparator for checking inside micrometers

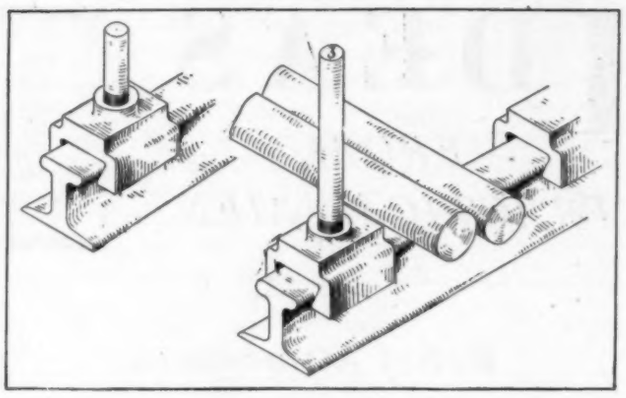
collars are nicely fitted, being kept in alignment by set-screws engaging a keyway running the full length. The collars are flattened on the bottoms so that the comparator will rest on the bench with the adjusting screw and the anvil uppermost. The collar at the left carries the anvil and the one at the right carries the adjusting screw, the ends of both anvil and adjusting screw being hardened and lapped. The center collar is cut away on top so as not to interfere with the micrometers being tested. It is always kept midway between the end collars to act as a support for the bed.

Test bars are used to set the comparator. They are made of ⅜-in. drill rod, hardened at the ends and afterward lapped to length, using a vernier height-gage to check the lengths.

A Rack for Heavy Stock

By Rowland L. Hill

A safe and convenient stock rack, which can be constructed easily and inexpensively, is shown in the accompanying illustration. The method of erecting it is as follows: two lengths of railroad track are laid parallel to each other upon the floor and conveniently spaced.



Substantial rack for heavy stock

The dovetail supports are slid onto the track and the upright posts are then screwed into them and down tightly against the rail. This locks the post and its support in position.

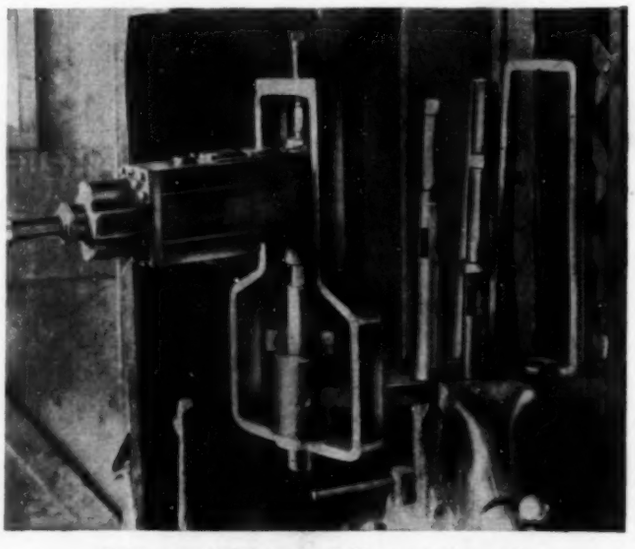
The dimensions of the supports are laid out to fit a standard rail. The castings are easily made, and all that is necessary then to complete the support is to tap the hole for the post. The sizes of stock that are carried can be stamped on the upper end of the post as shown. This will save time in measuring the stock and also help to keep each size in its proper place.

Facing Bearings With an Air Drill

By Herbert F. Crawford

The air drill is such a convenient tool in the railroad shop that there is little wonder at its extensive use. In this case it is used in connection with a simple frame, or yoke, to face the ends of bearings in the ends of valve motion levers and other parts, square with the bore.

Two forms of yokes are used, one being shown on the



Yokes for holding air drills to their work

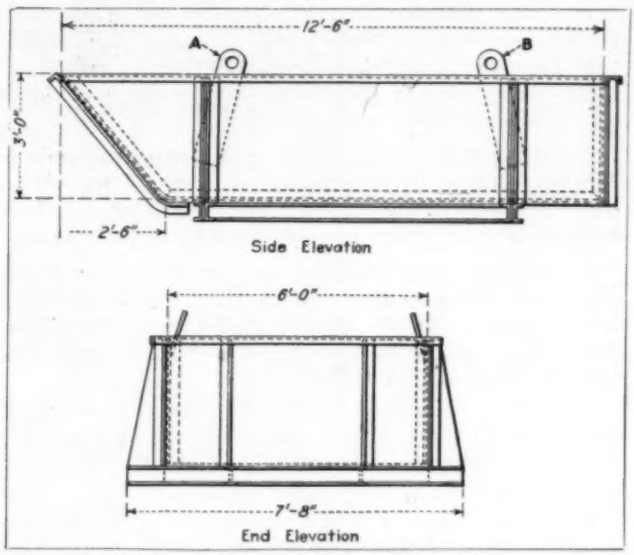
lever by the vise. In use the lever is first clamped in the vise, the bar with the facing cutter put in the air drill and in the hole, the yoke put over the lever end of the bar at the bottom and over the air drill at the top, and the long set screw turned in contact with the upper end. This set screw gives the feed for the facing cutter.

Buckets for Handling Steel Shavings

By Ralph N. Stryker
Tool Designer, Elliott Company

A type of bucket made to facilitate the handling of steel shavings in our shop is shown in the accompanying illustration. These buckets are constructed of steel angles, channels, I-beams and sheets and are made in a shape which permits of easy stacking. The interior measurements are 12 ft. 6 in. length, 6 ft. width and 3 ft. depth.

When loaded with chips the buckets are stacked in the main craneway in tiers of three. Six bucketfuls are



Skid or bucket for handling steel turnings

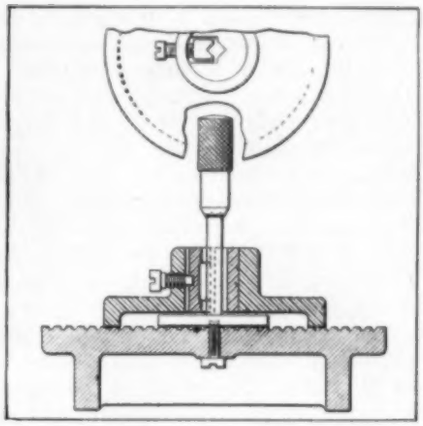
sufficient to fill a gondola car. In loading a car, the bucket is picked up by means of the four lugs shown in the drawing, at *A* and *B*, to which a four-way chain is attached. After the bucket has been lowered into the car, the chains are removed from the front lugs *A*, and the crane tips the bucket by means of the rear lugs *B*. The lip construction at the opposite end of the buckets enables the shavings to slide out easily into the car.

Repairing Micrometers

By A. J. Wormwood
Supervisor of Gages, Independent Pneumatic Tool Company

When a micrometer has a gritty feeling, or turns with difficulty, it should be washed in gasoline and then examined for scratches and dents in the barrel. If any are found, the barrel should be smoothed with a fine file and polished with crocus cloth, care being taken not to file out the graduations. If that does not cure it, the inner edge of the thimble should be examined for nicks that may have been made by a blow from some other tool. These high spots should be removed with a scraper.

If the "mike" binds during one part of the revolution of the screw, and turns freely during the other part, it means that the thimble has become eccentric. The high spot should be found and tapped lightly with the wooden handle of a screw driver. In spite of all this treatment, it may be found that the screw still turns with difficulty even though the adjusting nut is loosened to the limit. The trouble is that the screw and its bearing have been roughened and scored by dirt and other foreign matter working its way in. The hole in the frame should be lapped, and the spindle polished until both are smooth. The "mike" will then work as well as ever, and will also be accurate.



Fixture for lapping a micrometer spindle

Further investigation may show that the faces of the spindle and anvil are somewhat worn. If so, they should be lapped with a fixture similar to that shown in the illustration. This lap was originally suggested by C. L. Hill, and was published on page 66, Vol. 63, of the *American Machinist*. We have used one of these since we first read of it, and know that it does good work. An anvil of the removable type, that has worn out of square should be set up about 0.0005 in. before lapping, so that it will not be thrown out of parallel when it is set for size.

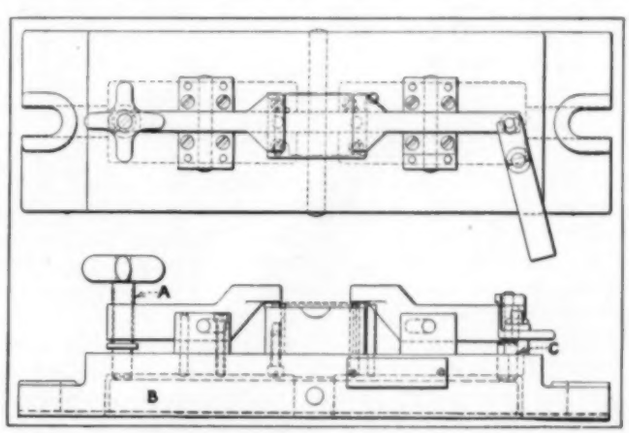
Repeated lappings will cause the end of the thimble to cover the 0.025-in. marks on the barrel. When this happens, the end of the thimble should be faced until it just splits the mark. The thread and the bearing then should be oiled, and if the micrometer is kept away from emery dust, and chips, it will not require attention again for a long time.

Fixture With Equalizing Clamps

By A. Becker

The illustration shows a fixture for holding work while the two opposite edges are being milled. The main feature of the fixture is that both clamps are tightened by one screw *A*, and that the pressure upon the work is equal at each end.

Directly under the clamping screw is a sliding plug which contacts with both the screw and the equalizing lever *B*. At the other end of the fixture is the sliding



Fixture with equalized clamping pressure

plug *C*, acted upon by that end of the equalizing lever. When the clamping screw is tightened, it forces down the plug under it, depressing that end of the lever. Depressing the left-hand end of the equalizing lever, raises its right-hand end and forces up the plug *C*. It will be seen that the pressure exerted by the screw will cause the heel of the clamp at the left to rise, and that this pressure transmitted through the equalizing lever and the plug *C* will have the same effect upon the heel of the clamp at the right. As both clamps are pivoted upon pins, raising their heels forces their toes down upon the work.

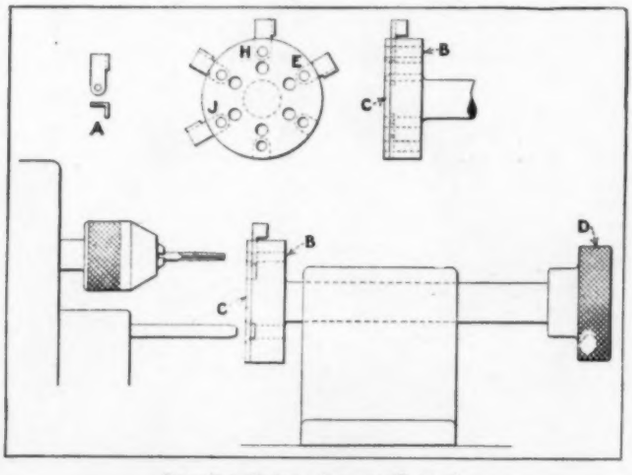
Both clamps are slotted where they bear upon their pivot pins, allowing them to be slid endwise on and off of the work. The clamp at the right is provided with a lever for ease of movement. When this clamp is off the work, the clamp at the left is, of course, loose enough to be moved by the fingers. In moving the clamp at the left, the length of its slot does not permit the clamping screw to come out of the line of contact with the plug beneath it.

An Efficient Tapping Fixture

By H. M. Darling
Engineer, Wells Tap & Die Company

In the illustration is shown a cheap and efficient fixture for tapping small brass parts, one of which may be seen at *A*. The parts are used in large quantities by a manufacturer of electrical goods.

The turret *B* has six openings to receive the work, which is confined by the plate *C* fastened to its face. Clearance holes are drilled through both the plate and the turret for the tap and the index pin to pass. The fixture is attached to the base of a small, motor-driven



Tapping fixture for small work

tapping machine and the turret shank is a sliding fit in the casting. The index pin, held in the base of the machine, is a free fit in the index holes in the turret.

In operation, the knurled knob *D* is held in the right hand and the turret is advanced, returned and indexed while the loading is done by the left hand at station *E*. Tapping is done at station *H*, and when the work reaches station *J*, it slides by gravity into a chute and is carried to a box conveniently placed. In cutting, the tap runs at 2,000 r.p.m. and in the reverse at twice that speed. Production by a girl operator is 1,350 pieces per hour.

Practical Shop Problems

Questions of a Practical Nature will be answered in this column

Straightening Tapered Rods

Q. We are making some tapered rods of round steel, 1.25 carbon. The rods are $\frac{7}{64}$ in. in diameter at the large end and $\frac{3}{64}$ at the small end, and are 30 in. long. They are hardened and then drawn to secure a spring effect. We find that they do not come out of the tempering bath straight, and would like any information that you may have in regard to a quick method of straightening them in quantities. Tensioning on an anvil with a hammer is out of the question.

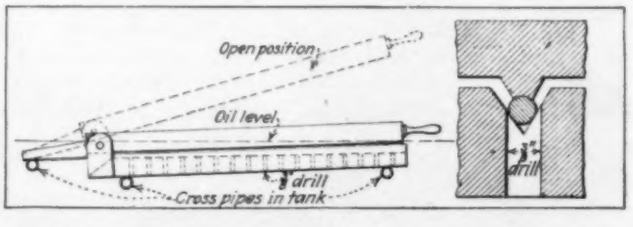
A. Straightening long, slim, spring-tempered rods is difficult, because they must be bent beyond the elastic limit to take out the kinks. The following are four methods of doing the work, suggested by several persons.

1. For large quantities, the obvious way to straighten such rods is in a swaging machine. The half-dies used should have a radius slightly larger than the $\frac{7}{64}$ in. dimension, a depth of 0.025 in. at the small end, and a taper of 0.036 in. to the foot.

It would be desirable to have the stroke of the machine made elastic, by placing pads behind the die blocks. This method is considered practical only if the rods are tapered originally in such a machine.

2. A light, high-speed riveting hammer is offered as a solution. Dies, similar to those suggested in the previous method, should be used, and the blow of the ram should be made elastic, so that the blow will not be heavy enough to mar the rods. The foot lever should be moved from the front to the side of the hammer, and the operator should stand so that the work moves away from him. The rods should be revolved and advanced at the same time, so that the path of the hammer blows forms a spiral. If the kinks are short and require too much hammering, in a solid die, it is suggested that the center of the anvil, or lower die, be cut away.

3. This suggestion contemplates keeping the rods straight during heat-treatment. For this purpose, two plates are hinged at one end. The lower plate is grooved to correspond with the taper of the rod, and the upper one is machined as shown at the right of the cut. Holes



are drilled into the groove, with a $\frac{1}{8}$ drill, on 1 in. centers, to provide free circulation for the quenching medium. The fixture rests on pipes placed crosswise of the tank, so that the rods will be completely submerged.

4. The final suggestion submitted was to the effect that a steel be chosen which would harden sufficiently in the swaging operation so that it would not require any heat-treatment.

Stub Spur Gear Diameters

With Working Clearance or Running Allowance Made

Number of Teeth	¾ Pitch Root Diameter	¾ Pitch Pitch Diameter	¾ Pitch Outside Diameter	⅘ Pitch Root Diameter	⅘ Pitch Pitch Diameter	⅘ Pitch Outside Diameter	⅚ Pitch Root Diameter	⅚ Pitch Pitch Diameter	⅚ Pitch Outside Diameter
12	3.363	4.000	4.488	2.489	3.000	3.389	2.033	2.400	2.676
13	3.696	4.333	4.821	2.739	3.250	3.639	2.233	2.600	2.876
14	4.030	4.667	5.155	2.989	3.500	3.889	2.433	2.800	3.076
15	4.363	5.000	5.488	3.239	3.750	4.139	2.633	3.000	3.276
16	4.696	5.333	5.821	3.489	4.000	4.389	2.833	3.200	3.476
17	5.030	5.667	6.155	3.739	4.250	4.639	3.033	3.400	3.676
18	5.363	6.000	6.488	3.989	4.500	4.889	3.233	3.600	3.876
19	5.696	6.333	6.821	4.239	4.750	5.139	3.433	3.800	4.076
20	6.000	6.667	7.155	4.489	5.000	5.389	3.633	4.000	4.276
21	6.363	7.000	7.488	4.739	5.250	5.639	3.833	4.200	4.476
22	6.696	7.333	7.821	4.989	5.500	5.889	4.033	4.400	4.676
23	7.030	7.667	8.155	5.239	5.750	6.139	4.233	4.600	4.876
24	7.363	8.000	8.488	5.489	6.000	6.389	4.433	4.800	5.076
25	7.696	8.333	8.821	5.739	6.250	6.639	4.633	5.000	5.276
26	8.036	8.667	9.155	5.989	6.500	6.889	4.833	5.200	5.476
27	8.363	9.000	9.488	6.239	6.750	7.139	5.033	5.400	5.676
28	8.696	9.333	9.821	6.489	7.000	7.389	5.233	5.600	5.876
29	9.030	9.667	10.155	6.739	7.250	7.639	5.433	5.800	6.076
30	9.363	10.000	10.488	6.989	7.500	7.889	5.633	6.000	6.276
31	9.696	10.333	10.821	7.239	7.750	8.139	5.833	6.200	6.476
32	10.030	10.667	11.155	7.489	8.000	8.389	6.033	6.400	6.676
33	10.363	11.000	11.488	7.739	8.250	8.639	6.233	6.600	6.876
34	10.696	11.333	11.821	7.989	8.500	8.889	6.433	6.800	7.076
35	11.030	11.667	12.155	8.239	8.750	9.139	6.633	7.000	7.276
36	11.363	12.000	12.488	8.489	9.000	9.389	6.833	7.200	7.476
37	11.696	12.333	12.821	8.739	9.250	9.639	7.033	7.400	7.676
38	12.030	12.667	13.155	8.989	9.500	9.889	7.233	7.600	7.876
39	12.363	13.000	13.488	9.239	9.750	10.139	7.433	7.800	8.076
40	12.696	13.333	13.821	9.489	10.000	10.389	7.633	8.000	8.276
41	13.030	13.667	14.155	9.739	10.250	10.639	7.833	8.200	8.476
42	13.363	14.000	14.488	9.989	10.500	10.889	8.033	8.400	8.676
43	13.696	14.333	14.821	10.239	10.750	11.139	8.233	8.600	8.876
44	14.030	14.667	15.155	10.489	11.000	11.389	8.433	8.800	9.076
45	14.363	15.000	15.488	10.739	11.250	11.639	8.633	9.000	9.276
46	14.696	15.333	15.821	10.989	11.500	11.889	8.833	9.200	9.476
47	15.030	15.667	16.155	11.239	11.750	12.139	9.033	9.400	9.676
48	15.363	16.000	16.488	11.489	12.000	12.389	9.233	9.600	9.876
49	15.696	16.333	16.821	11.739	12.250	12.639	9.433	9.800	10.076
50	16.030	16.667	17.155	11.989	12.500	12.889	9.633	10.000	10.276
51	16.363	17.000	17.488	12.239	12.750	13.139	9.833	10.200	10.476
52	16.696	17.333	17.821	12.489	13.000	13.389	10.033	10.400	10.676
53	17.030	17.667	18.155	12.739	13.250	13.639	10.233	10.600	10.876
54	17.363	18.000	18.488	12.989	13.500	13.889	10.433	10.800	11.076
55	17.696	18.333	18.821	13.239	13.750	14.139	10.633	11.000	11.276
56	18.030	18.667	19.155	13.489	14.000	14.389	10.833	11.200	11.476
57	18.363	19.000	19.488	13.739	14.250	14.639	11.033	11.400	11.676
58	18.696	19.333	19.821	13.989	14.500	14.889	11.233	11.600	11.876
59	19.030	19.667	20.155	14.239	14.750	15.139	11.433	11.800	12.076
60	19.363	20.000	20.488	14.489	15.000	15.389	11.633	12.000	12.276
61	19.696	20.333	20.821	14.739	15.250	15.639	11.833	12.200	12.476
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65	21.030	21.667	22.155	15.739	16.250	16.639	12.633	13.000	13.276
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67	21.696	22.333	22.821	16.239	16.750	17.139	13.033	13.400	13.676
68	22.030	22.667	23.155	16.489	17.000	17.389	13.233	13.600	13.876
69	22.363	23.000	23.488	16.739	17.250	17.639	13.433	13.800	14.076
70	22.696	23.333	23.821	16.989	17.500	17.889	13.633	14.000	14.276
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76	24.696	25.333	25.821	18.489	19.000	19.389	14.833	15.200	15.476
77	25.030	25.667	26.155	18.739	19.250	19.639	15.033	15.400	15.676
78	25.363	26.000	26.488	18.989	19.500	19.889	15.233	15.600	15.876
79	25.696	26.333	26.821	19.239	19.750	20.139	15.433	15.800	16.076
80	26.030	26.667	27.155	19.489	20.000	20.389	15.633	16.000	16.276
81	26.363	27.000	27.488	19.739	20.250	20.639	15.833	16.200	16.476
82	26.696	27.333	27.821	19.989	20.500	20.889	16.033	16.400	16.676
83	27.030	27.667	28.155	20.239	20.750	21.139	16.233	16.600	16.876
84	27.363	28.000	28.488	20.489	21.000	21.389	16.433	16.800	17.076
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90	29.363	30.000	30.488	21.989	22.500	22.889	17.633	18.000	18.276
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95	31.030	31.667	32.155	23.239	23.750	24.139	18.633	19.000	19.276
96	31.363	32.000	32.488	23.489	24.000	24.389	18.833	19.200	19.476
97	31.696	32.333	32.821	23.739	24.250	24.639	19.033	19.400	19.676
98	32.030	32.667	33.155	23.989	24.500	24.889	19.233	19.600	19.876
99	32.363	33.000	33.488	24.239	24.750	25.139	19.433	19.800	20.076
100	32.696	33.333	33.821	24.489	25.000	25.389	19.633	20.000	20.276

Contributed by A. Wasbauer, Standardization Engineer, The Ingersoll Milling Machine Company

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Red Herrings

IT WILL not be wise to get too excited over the violent protests entered by certain of our friends across the water against the tentative schedules in the pending tariff legislation.

In the first place, the law has not as yet been passed. Nor has it been signed by President Hoover, whose tariff views are on record in his message to the special session now sitting.

In the second place, let us remember that the average European premier is working with from three to a score of parties, as against our two, and that his government may fall over night. Such being the case, it is not at all surprising that he should divert national attention from his country's own internal problems by using the iniquitous United States tariff as a particularly opportune and odoriferous red herring, the oldest trick in the political box.

*

Collective Thinking

MANY things have combined to direct national attention to the perennial problem of the farmer. Lest some of us should think that the problem has entered a new phase, let it be said that in the opinion of at least one well-informed observer the average farmer has failed to make an operating profit during the last twenty-five years. If he is any better off now it is chargeable to the appreciation in value of his land.

Of the many reasons given for the farmer's misfortunes undoubtedly the most significant is his unalterable individualism. He has always relied on his own efforts and resources, and he has been encouraged in this attitude by many politicians.

However praiseworthy this self-reliance may be it has one drawback when the time comes for the farmer to market his produce. If he relies entirely on himself, he is more than likely to rush his crops into a glutted market at the wrong moment. He is equally likely to plant the wrong crop, or too much or too little of the right crop.

Where he has substituted a certain amount of collective thinking for individual initiative and marketed his crops through a co-operative body of some sort he has been far better off. In so doing he is but following the lead of his successful brother in business or industry. If he is willing to accept the principle whole-heartedly there is no reason why he should not prosper equally.

The moral of all this for the industrialist is that he can easily work himself into the same fix as the individualistic farmer if he persists in the same mental attitude. Unfortunately, there are still many men in business who are not availing themselves of the information readily at hand by which to guide their affairs to commercial success. Such men should take heed from the plight of the farmer.

*

Decentralizing Factory Districts

DECENTRALIZATION of industry is a problem that has many phases. Those who feel that it means splitting large organizations into small separate concerns seem doomed to disappointment. The tendency is all the other way at present.

Decentralization, or scattering the location of the plants themselves, however, may not be such a dream as seemed likely a few years ago. There is a tendency, in some quarters at least, to take plants out of large cities and away from what we have called industrial centers, and locating them in the country, away from crowded city streets where high buildings are a necessity.

A plant recently visited, ten miles from a large city, showed some of the advantages. An attractive administration building, splendidly lighted and ventilated, has been built at a comparatively low cost. Behind the office building is a large grove where in fair weather picnic lunches are the order of the day, and the afternoon finds the employees refreshed for the work in hand. Open air spaces also adjoin the shop and similar conditions prevail there with quoits as the noon day diversion.

A majority of the employees live within walking distance and those who use automobiles have comparatively free road conditions with but little of the nerve strain that accompanies driving in congested city streets. The management of this plant is strong for the decentralized factory districts. Plants that must increase their capacity might do well to consider the question carefully.

SHOP EQUIPMENT NEWS

Cincinnati No. 3 Plain, Universal and Vertical Milling Machines

THE Cincinnati Milling Machine Company, Cincinnati, Ohio, announces the No. 3 knee and column type machine shown in Fig. 1, which differs radically in construction from previous models. The machine is made in plain, universal and vertical models, and with belt or inclosed chain motor drive. Operating convenience is the keynote of the design. One notable feature is the automatic power shift for the spindle speeds as well as the table feeds, controllable from either the front or the rear of the machine. Fig. 3 illustrates the changing of the speeds from the front of the machine at *K*, while Fig. 2 shows how the feeds are changed from the rear, at *G* and *H*. The operator merely engages the lever and makes his selection of feed or speed from the power driven dial.

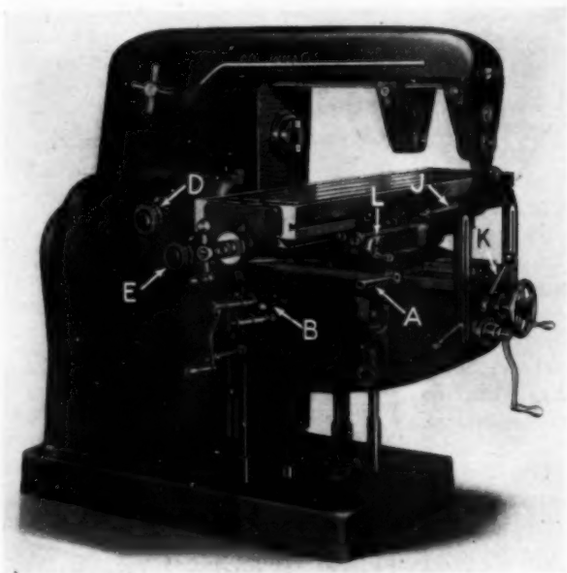


Fig. 1—No. 3 Cincinnati Knee and Column Type Milling Machine

A simple mechanism within the machine positions the gears to obtain the feed or speed desired. By conveniently locating the speed and feed changing lever *H*, and removing the manual effort from speed and feed changing, operators will be more likely to change the feed and speed demanded by the cut, resulting in greater production and a higher quality of the milled surface. Sixteen speeds ranging from 14 to 450 r.p.m. are clearly indicated on the upper dial *D*, located on the side of the machine. Sixteen feeds appear on the dial *E*, in a lower position. Three different series of feeds, known as the low, $\frac{1}{4}$ to 10 in., standard, $\frac{1}{2}$ to 20 in., and high, $\frac{3}{4}$ to 30 in., can be supplied. One of the additional conveniences provided is the independent directional control levers for cross, vertical, and longitudinal movements of the table in or out, up or down, left or right.

Every movement has a power rapid traverse *A*, in addition to the power feed, operable from either the front or rear. This rapid traverse is available with the spindle running or idle. Traverse rates are, longitudinally, 100 in., cross 50 in. and vertical, 50 in. per min. The operator can take a cut with his right hand on the directional control lever *J* and the left hand on the power quick traverse *A*, which is also controlled by handle *C*. To rapid traverse out of the cut he shifts the feed lever in the opposite direction and pushes down on the power quick traverse lever. As soon as he releases his hand the mechanism clicks into feed. The rapid traverse for the table on the plain machine can be disengaged automatically by dogs on the side of the table. This machine has hand adjusting cranks for getting accurate cross and vertical adjustments at the rear as well as at the front. Large micrometer dials are provided for accurately getting the desired hand feed.

Careful tests have resulted in the selection of a special lubrication method for each unit. The mechanism within the column, including the spindle drive, runs in a bath of oil supplied by a geared pump in the column. A pump located in the knee automatically lubricates the knee, while the saddle and table are lubricated by what is known as the "one-shot" oil system located at the left end of the saddle at *L*. A few turns of the crank forces oil under pressure to all the bearing surfaces.

Anti-friction bearings are used throughout the spindle drive. The Cincinnati double mounting of anti-friction bearings, both front and rear on the spindle, with a floating rear bearing, are used on this machine. Substantial gears slide on heat-treated splined shafts. The face gear is $12\frac{13}{16}$-in. pitch diameter with a 2-in. face and is mounted on the spindle close to the front bearing. Gear contacts in the spindle drive have been reduced to 4 forward and 5 in reverse. A multiple disk clutch running in oil is also used.

The rectangular overarm has been increased in size. The two arbor supports are of aluminum and automatic lubrication is provided for the bearing collars. The supports are 50 per cent lighter, yet stronger than the

Fig. 2—How feeds are changed from the rear

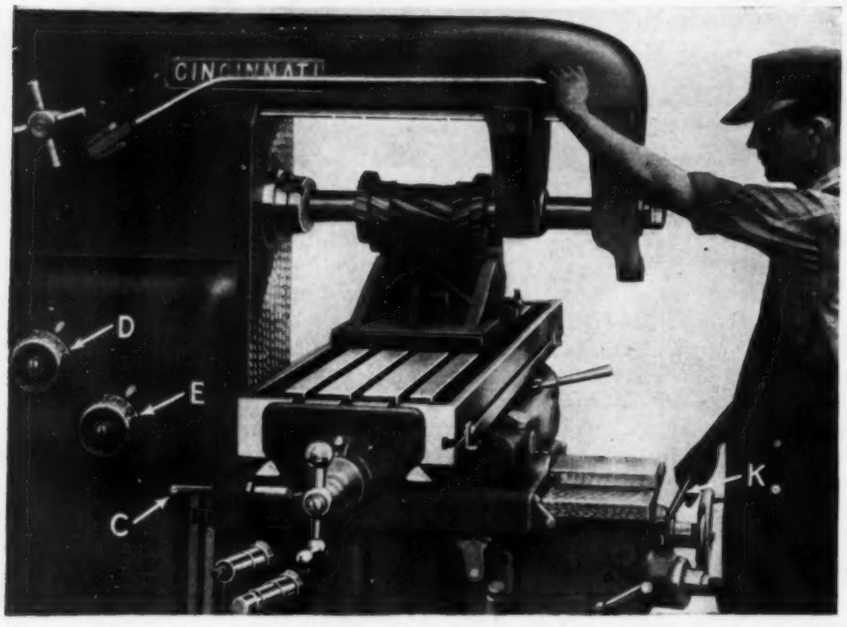


Fig. 3—Changing the spindle speeds from front of machine

cast-iron ones, which will be appreciated by the operator who must change cutters and arbors frequently. There are no universal joints. The vertical driveshaft is inclosed, adding to the safety of the operator.

A cutter coolant pump having a capacity of 8 gal. per min. is supplied as regular equipment. The coolant drains from the table into the saddle through a large opening in the back side. A cored passage in the saddle carries it over to a pocket on the side of the knee from whence it drains straight down into the base through the telescoping pipe. The openings in the return pipe are large and accessible.

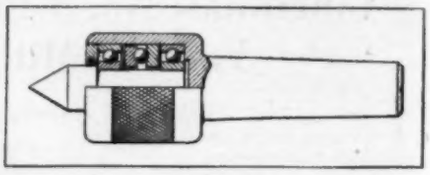
The leadscrew is large and has a long bearing in the leadscrew nut. It is thoroughly lubricated by the "one shot" system, which lubricates the table ways. This insures less distortion of the screw and less wear in the nut. The elevating screw is a single piece screw with a large thread bearing.

The general proportions of the knee, column, and other parts have been increased in dimensions. The broader bearing surfaces increase stability and decrease wear. The solid top knee with its narrow guide and square gibbing assure smooth cross movement, making it accurate to dial. Wipers are provided for the saddle at both front and rear.

The table for all three machines, plain, universal and vertical, have a working surface and a size overall of 62½x15 in. with 3 $\frac{3}{16}$-in. T-slots. The table on the No. 3 universal swivels 45 degrees. The longitudinal feed is 34 in. on all three machines. The cross feed is 12 in. on the plain and universal, and 16 in. on the vertical machine. The vertical feed is 20 in. on the plain, 19 in. on the universal, and 12½ in. on the vertical machine. A 7½-hp. motor, 1,750 r.p.m., is recommended for all machines. The machines weigh 6,900, 7,200 and 7,400 lb., respectively. The No. 3 vertical has the same features as the plain machine, but has an adjustable head travel of 6 in., and can be supplied with either hand or power feed to the head. The maximum distance from spindle nose to table is 22 in., and the throat distance from center of the spindle to the column is 18 inches.

"Alive" Ball-Bearing Tailstock Center

A ball-bearing tailstock center with heavy load capacity is being manufactured by the Modern Machine Corporation, 285-287 North 6th St., Brooklyn, N. Y. The shank of this center fits into the tailstock in place of the dead center, but in the "Alive," instead of the work revolving upon the point of the dead center, the center itself revolves with the work. There is thus no wear upon the center point; it cannot be burned, and regrinding of the point is never necessary. Also, the center hole in the work is not enlarged, a feature in the working of soft metals or where



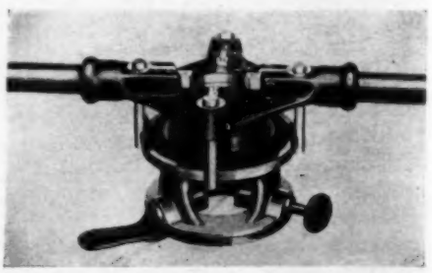
"Alive" Model LC Light-Duty Ball-Bearing Tailstock Center

the work must be mounted upon arbors.

The center point of the "Alive" ball-bearing center revolves upon precision radial ball bearings, and the thrust load is taken upon a ball thrust bearing. The center point is made of tool steel, hardened and ground. The shank, together with the housing, is made of high-carbon steel, the shank being ground by a method which assures concentricity of the revolving center point with it. The bearings, being completely protected from dirt and chips, run in oil. The center is obtainable in sizes with center numbers varying from 1 to 4 and with Morse taper numbers varying from 1 to 4. Brown & Sharpe, Jarno, and other tapers are furnished as special jobs, as are pipe centers, woodturning centers, and countersink centers. The manufacturer claims low maintenance cost and increased production for this center.

Oster "Leader" Die Stock

Universal guides that automatically center the pipe is an improved feature of the "Leader" die stock placed on the market by the Oster Manufacturing Company, Cleveland, Ohio. This tool threads pipe from 1 to 2 in. inclusive, and it is claimed that the

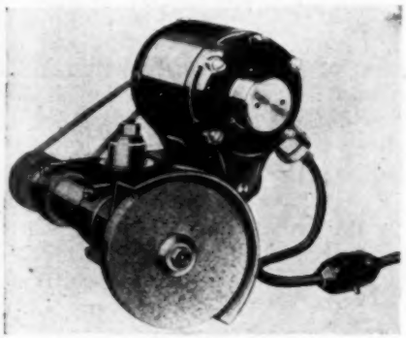


Oster "Leader" Die Stock

universal pipe guides, the ratchet construction, and the floating stud arrangement, together with fully adjustable dies, make it easy to operate and fast in threading operations. The stock is available in two types, the No. 1, a plain tool without the ratchet device feature, and the No. 1A with the ratchet construction. On the ratchet-tool, the ratchet can be set for forward or reverse or locked by the use of a control wheel.

Dumore No. 5 Grinder

Speeds from 4,000 to 35,000 r.p.m. are available through a set of quick-change pulleys on the No. 5 grinder announced by the Dumore Company, of Racine, Wis. Two interchangeable quills are provided, one for external



Dumore No. 5 Grinder

and one for internal grinding. A special quill for the use of pencil wheels can be obtained. Power is obtained through a ½-hp. universal motor, and ample ventilation prevents heating regardless of load or speed. A positive and very simple system provides proper lubrication for the spindle bearings. Equipment includes wheels from ½ to 5 in. in diameter. Automatic belt tension, separable tool post, radial and vertical adjustment of the grinder in the lathe or other machine tool, and light weight are additional features.

One advantage of the unit is that the tool post can be mounted independently of the grinder in the lathe, planer, shaper, milling machine, or other machine tool. A convenient locknut on the right side of the frame locks the grinder rigidly in place. The No. 5 "Dumore" is capable of handling heavy grinding and yet maintain limits as close as 0.0001 inch.

Buda Safety Self-Lowering Jacks

Several important features have been added to the line of safety self-lowering jacks made by the Buda Company of Harvey, Ill. These jacks are made in four sizes of 35-, 50-, 75- and 100-ton capacity and are particularly designed for railroad shop use, although they also have general shop application. In each case the extended height is 26 in., instead of the usual 24 for railroad work, and the rise varies from 18 in. in the case of the 35-ton jack to 15 in. in case of the 100-ton size.

Some of the features are: Use of automatic locking key as shown in Fig. 2, to prevent ram from turning while lifting the load; release of automatic key to allow ram to lower without load; improved lever socket with the pawl and ratchet entirely inclosed and packed in grease; a one-piece electric steel casing; and direct lubrication to the bronze nut. The lowering speed is under control at all times, and this can be varied for lowering either heavy or light loads. A safety lock is provided on the lowering device.

The construction of the 50-ton jack is shown in Fig. 2. Ball bearings are used throughout. The gears are alloy steel, heat-treated forgings, and the worm on the ratchet shaft is also a special alloy steel, machine cut and heat-treated. It drives a bronze wheel mounted on a shaft carrying a bevel pinion that in turn drives the large bevel gear on the elevating screw. A ball thrust bearing is placed under the large bevel gear. The ram itself is made from solid bar stock, and is capped by a steel forging. The inset in the ram is a graduated scale made of brass showing the rise of the jack. A special bronze nut is inset in the end of the ram, and it engages the steel screw which is of such a pitch that it is self-lowering. Control of the speed of lowering is through a brake wheel mounted on an auxiliary shaft, driven through a worm and wheel and also carried on ball bearings. Another feature of the jack is a safety device to prevent the ram or standard from being raised to a dangerous point when lifting the load.

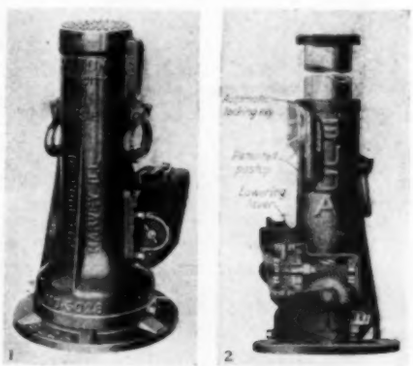
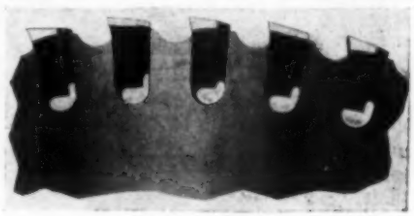


Fig. 1—Buda 50-Ton Safety Self-Lowering Jack. Fig. 2—Cut-away view showing the construction

Hunter Inserted-Tooth Saw

Developed for high-speed cutting, an inserted-tooth saw has been put on the market by the Hunter Saw & Machine Company, 57th & Butler Sts., Pittsburgh, Pa. As shown, the teeth and pockets of the saw are both serrated, thus locking the teeth firmly in the saw body and preventing movement of the teeth during cutting. Teeth are adjustable by moving them



Section of Hunter Inserted-Tooth Saw, showing method of locking the teeth

up or down on the serrations. The teeth are ground in the saw and the only time it is necessary to remove them is for replacement when worn out. The saws are manufactured in a variety of thicknesses of plates and kerfs.

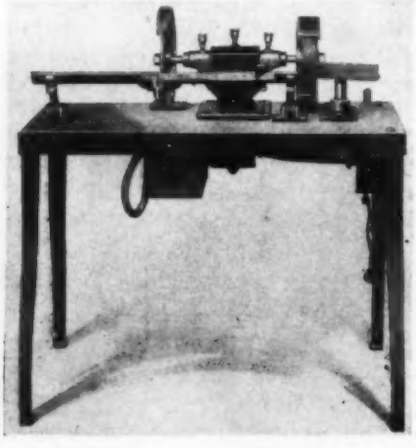
"Raco" Packaged Welding Rod

Welding rod manufactured by the Reid-Avery Company, Inc., 21st St. & Washington Ave., Philadelphia, Pa., is now being offered in an improved 50-lb. package designed for convenience, cleanliness, and for proper handling of the rods in storage and use. A pressed-steel cup is fitted snugly over each end of the standard bundle of welding wire.

Three wires of the same analysis as the wire in the package are welded to the edges of each cup, holding the cup in place and giving the package strength and lightness. The package is then rolled in several plies of heavy paper which is cemented at the ends to the steel cups, producing an airtight and waterproof package. The face of each steel cup is painted in a distinctive color and printed to show the grade and size of the wire in the package.

Wadsworth No. 1 Core-Cutting and Coning Machine

A portable, motor-driven cutting-off and coning machine for the core maker is being manufactured by the Wadsworth Core Machine & Equipment Company, Akron, Ohio. The machine has a capacity of $\frac{3}{8}$ to $2\frac{1}{4}$-in. cores and can be moved to any convenient place. It is powered with a $\frac{1}{4}$-hp., 110-volt, a.c. motor, which may be driven from the ordinary light circuit. All working parts are fully guarded and ample lubrication is accomplished from convenient points on the machine. The motor is controlled by a push-button switch located at the operator's right hand.



Wadsworth No. 1 Core-Cutting and Coning Machine

This machine is equipped with guarded cutting-off and coning wheels, a swinging rest for holding the core while it is being cut off, and an adjustable core rest for the coning wheel. The swinging rest has a graduated scale and a movable stop that can be adjusted to give any length of core desired. The coning-wheel core rest allows the operator to make any desired taper or cone on the end of the core.

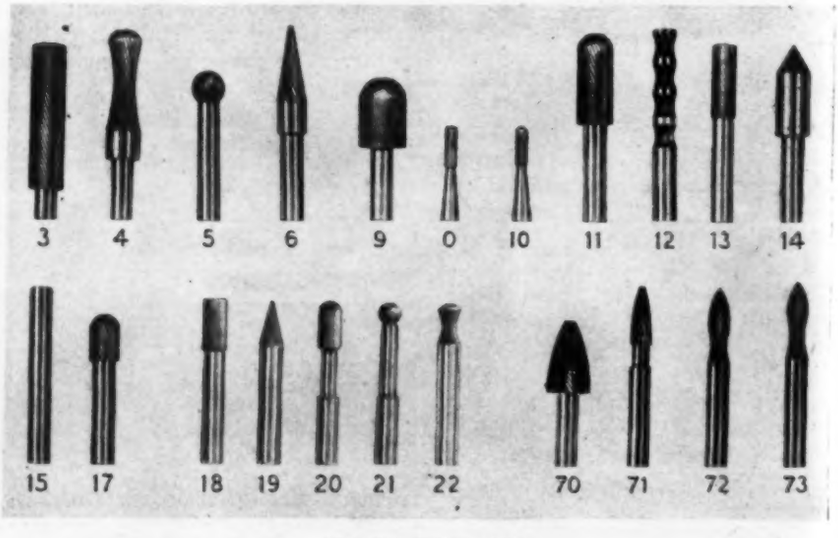
Simonds "Red Streak," High-Speed-Steel Hacksaw Blades

An improved series of high-speed hacksaw blades is being manufactured by the Simonds Saw & Steel Company, Fitchburg, Mass. A different steel is being used for the blade, and an improved setting device is used to make the set of the teeth uniform on both sides to insure straight cutting. A feature of this line is the fool-proof marking by which the "pull" end of the blade is designated to insure proper setting in the frame. The blade is available in all standard sizes for both hand and power saws. The tungsten blade is marked with a red end, the high-speed blade with a red back.

"Profilo" Rotary Files

A complete line of 22 shaped rotary files for flexible shaft equipment, for bearings, die sinking, and metal pattern making is being introduced by the Rotary File Company, 14063 Welland Ave., Detroit, Mich. The manufacturer claims for this line of files ability to cut a true outline, to give a smooth surface finish, and to give fast cutting speed. All files of the line have their teeth milled and generated, thereby giving a continuous outline to the cutting edge of each tooth. The teeth are cut on a strong left-hand helix to avoid chattering and hogging-in of the file and to give a smooth surface finish similar to that created by milling. The combination of a strong helix and fairly coarse pitch of the teeth permits a fast cutting speed without impairing the finish of the surface worked upon.

All of the line of files have a $\frac{1}{4}$-in. diameter shank, are made of special steel and hardened to make them adaptable to filing operations in connection with flexible shafts, in profiling machines, or in drill presses for burring small parts. All the standard shapes are carried in stock.

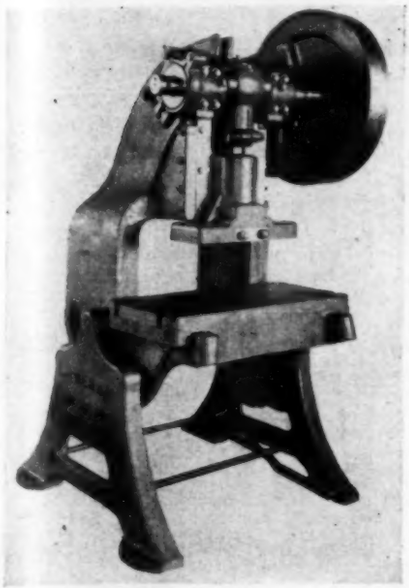


"Profilo" Rotary Files

Federal No. 33 Punch Press for Large Light Work

Having large die space and bed area coupled with high speed and low power demands, a No. 33 punch press suitable for large and light work has been placed on the market by the Federal Press Company, Elkhart, Ind. This press can be used advantageously in the production of parts which require the use of progressive dies and has an opening in the bed which permits the dropping through of parts or scrap from extremely long progressive dies.

The pressure of the ram near the bottom of the stroke is about 26 tons, the standard stroke being 1 in., and the maximum stroke at extra cost, $1\frac{1}{2}$ in. The adjustment down from the top does not exceed 2 in. and the



Federal No. 33 Press for Large Work

size of the square hole provided for round or square punch shanks is about $1\frac{9}{16}$ in. The ram face from right to left is 18 in. and from front to back $7\frac{1}{2}$ in. Die space, bed to slide, stroke down, adjustment up, is $9\frac{1}{4}$ in. The size of the oblong opening in the bed is 21x6 in., the opening through the back is $20\frac{1}{2}$ in., and the bed is inclinable from the upright to 40 deg. Weight of the complete machine is 3,100 lb. and the overall floor space required is $35x44\frac{1}{2}$ inches.

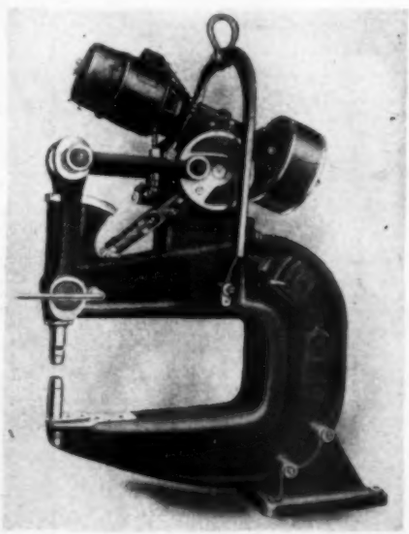
"Imperial Major" High-Speed Tool Steel

A high-speed tool steel is being marketed by Edgar Allen Steel Company, Inc., 741 Washington St., New York, N. Y. To obtain the requisite uniform quality, the steel is manufactured in a high-frequency electric furnace which is claimed to eliminate sulphur, phosphorus, and other impurities that are detrimental to this type of steel. The steel is manufactured to be used for boring tools, lathe tools, planing tools, and slotting and forming tools where great speeds and heavy cuts are demanded. It is supplied in the usual bar sections and in forged flanges and also may be obtained for toolholders in small pieces ready hardened for use. It may be hardened either in a blast of cold air or in oil. This steel may also be used for machining high-manganese steels.

"L.M.G" Electro-Mechanical Riveting Machines

SEVEN sizes of electro-mechanical, toggle-lever riveting machines, having working pressures ranging from 27 to 145 tons, and capacities to drive from $\frac{5}{8}$- to $1\frac{5}{16}$-in. boiler rivets, have been placed on the market by the United Machine Tool Corporation, 75 West St., New York City. The 35-ton, or second, size will give 24 strokes per min., and the power consumption is small. Motors ranging from 2 to $7\frac{1}{2}$ hp. are used. The machines can be had for all stationary and portable uses, and special designs may be obtained for working in close quarters, on tubes, chassis frames, girder masts, and other equipment.

The motor, as will be noted from the accompanying illustration, is mounted just under the yoke at the top of the machine, and drives two disks through a bronze wormwheel meshing with a steel worm. The handle for engaging and disengaging



"L.M.G." Electro-Mechanical, Toggle Lever Riveting Machine made in siven sizes

the clutch between the wormwheel and the driving disk is located at a convenient position near the jaws. The machine may be adjusted to work consecutively, stroke after stroke, or so that the spindle stops at the top and bottom of each stroke, permitting the rivets to cool under pressure.

The spindle is adjustable and carries a top snap. The height of gap is usually $15\frac{3}{4}$ or $19\frac{3}{4}$ in., but any other height of gap may be had. The depth of the gap is variable from 1 ft. to 13 ft. 2 in. The machine is suspended at its center of gravity, and it will work in any position. Special types of hangers, such as swing cradle hangers permitting the sideways tilting of the machine, and semi-universal, and universal hangers can be had at additional cost. A flywheel is mounted on the motor and is connected by friction means to the main driving shaft of the machine, thus providing smooth operation with plenty of power. It is disconnected automatically from the main driving shaft in case of overload. A detachable foot is available by which the machine may be used as a stationary type, the work being brought to it. The smallest, low-pressure machine has dimensions of $31\frac{1}{2}x54\frac{1}{4}x71$ in., the weight being 2,030 lb. The largest high-pressure machine occupies a space $27\frac{5}{8}x98\frac{1}{2}x$ 232 in., and weighs 43,870 pounds.

Ex-Cell-O Grinding Machine Spindles

Two grinding machine spindles, the first an internal grinding machine spindle,illustrated in Fig. 1, for the No. 12 Hydromatic grinder, manufactured by the Greenfield Tap & Die Corporation, and the second, shown in Fig. 2, a spindle for surface grinding machines, have been placed on the

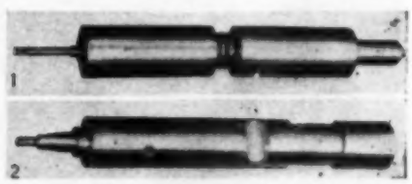


Fig. 1—Ex-Cell-O Spindle for Greenfield No. 12 "Hydromatic" Internal Grinder
Fig. 2—A spindle for surface grinding machines

market by the Ex-Cell-O Aircraft & Tool Corporation, Detroit, Mich. Both types are provided with ball bearings, and are of the fundamental design found in the company's line.

Micro Model J.G. Cylinder Grinder

EMPLOYING a pantograph spindle drive mechanism, the Model J.G. cylinder grinding machine has been placed on the market by the Micro Machine Company, Bettendorf, Iowa. This pantograph drive insures a constant peripheral speed to the grinding wheel. The circular dial on the front of the headstock permits the operator to set the planetary speed of the grinding head to suit the diameter of hole to be ground. The hydraulic table drive provides traverse speeds ranging from a few thousandths per minute up to several feet per minute in rapid traverse. The push-button stations that control the main drive motor and the exhaust fan motor are located on the side of the headstock toward the operator.

The machine has capacity to grind bores ranging from 4 to 24 in. or larger in diameter and up to 48 in. in depth. The main cylinder is 36 in. in length by 14 in. in diameter, and has a 4-in. eccentric throw, thus permitting the maximum use of the grinding wheels. The main work carrying table is 96 in. long without the dust aprons, and 26 in. wide. The distance from the top of the table to the center of the grinding circle is 24 in. This dimension may be increased to suit varying work mounting requirements. The base casting is 12 ft. 6 in. long by 42 in. wide and the height of the machine over all is 76 in. The headstock casting which carries the grinding head rests full length upon the main base casting. The main cylinder revolves in large bronze bearings, lubricated with a force feed oiling system. A variable-speed drive for proportioning the main cylinder speed to suit the diameter of the hole being ground permits heavy grinding cuts and insures a round cylinder.

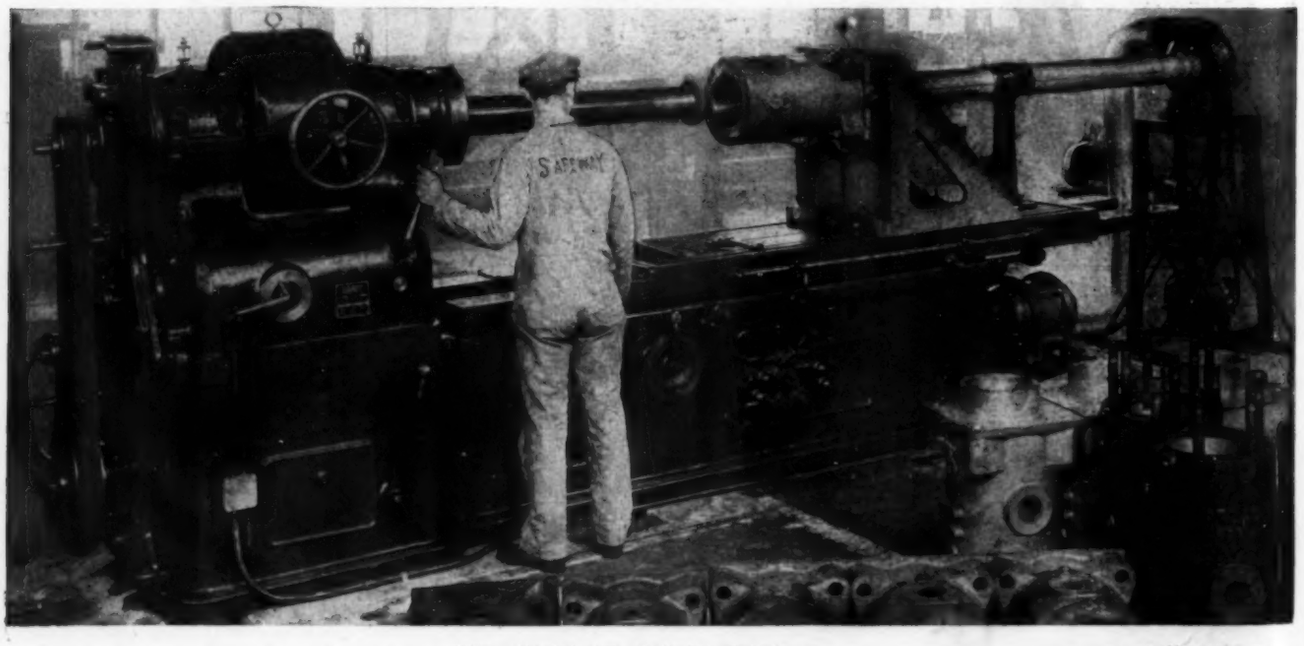
The machine proper is driven by a 10-hp. motor operating at 1,200 r.p.m., and an additional 3-hp. motor is required for operating the dust exhauster. A telescoping pipe from the intake of the suction exhauster runs in a straight line to the work. The work end of this suction pipe is shaped like a funnel to fit the cylinder. Table slide-ways are protected against the admission of dust. They are lubricated with a forced-feed oiling system which returns the oil to a centralized tank where the lubricant is clarified.

Lengthwise T-slots in the top of the work table permit mounting various types of work-holding fixtures. The fixtures shown in the accompanying illustration affords a means of quickly and accurately centering the cylinder bore with the protruding outside diameter of the liner. In the manufacture of some Diesel engines it is advantageous to grind the bores before pressing the liners into the water jackets, in which event the steady-rest type of fixture permits a quick set up, and eliminates the danger of out of roundness due to tight clamping, the liner being held by finger tension of the setscrews. These steady-rest fixtures can be spaced to accommodate long and short work, and the length of the setscrews can be increased where small diameters are to be held.

The approximate net weight of the machine is 18,000 pounds.

Jessop "Albor" Die Steel

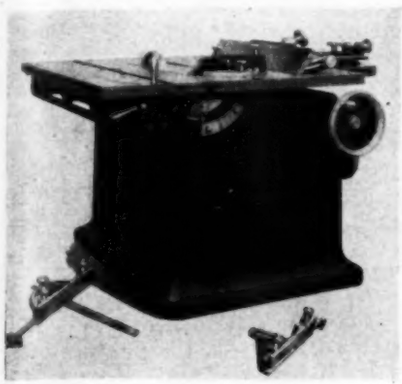
A carbon-chromium alloy steel specially adapted for stamping white gold and hard metal used in the manufacture of jewelry is being manufactured by William Jessop & Sons, Ltd., Sheffield, England, and is being marketed by the New York office of the company at 121 Varick St., New York. The steel contains about 0.90 per cent carbon, 0.90 per cent chromium and 0.30 per cent molybdenum. An unusual depth of hardness is claimed for this steel, together with ease of machining after being annealed by a special process. The steel may be drawn by color in the customary fashion.



Micro Model J.G. Cylinder Grinder

Fay & Egan No. 575 Double-Arbor Universal Saw

Two saws and two motors operated by a single control are embodied in this No. 575 all-electric, ball-bearing-equipped, double-arbor, universal saw placed on the market by the J. A. Fay & Egan Company, Cincinnati, Ohio. Operating effort is lessened and output increased through the fact that either a rip saw or a cross-cut saw, direct-motor-



Faw & Egan No. 575 Double-Arbor Universal Saw

driven, can be had by rotating the revolving motor frame. No belts, countershafts, nor motors project outside the machine. The machine with a 14-in. saw will rip 26 in. between the saw and the fence and through material 3 in. thick, or 4 in. thick with a 16-in. saw.

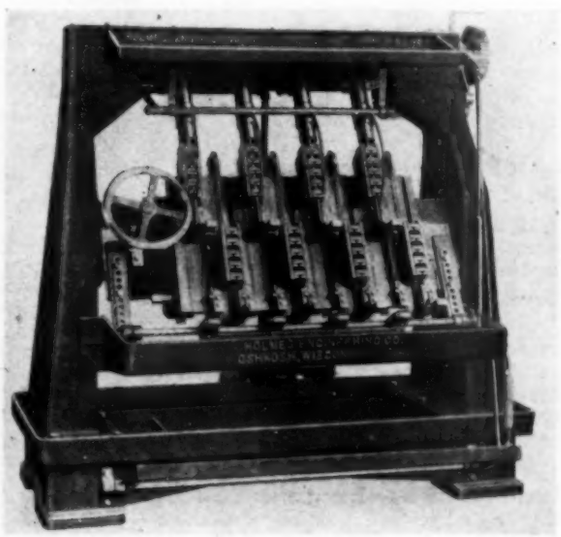
The frame is a massive one-piece casting with an extra large floor base, the shaving chute being built-in for an exhaust connection. A removable cover is provided for easy access to the saws.

A motor is built directly on each arbor, both motors being carried in a revolving frame with a plate 21½ in. in diameter and having a wide bearing face set in a turned seat in the front of the column. The plate bearing serves to keep all sawdust away from the motors and other working parts of the machine. The table is made in two sections, a moving section, 44 x 17 in., mounted on antifriction rollers, and a stationary section, 44 x 26 in., having an extension so that material up to 26 in. wide can be ripped. The rollers under the moving table are held in a frame and run on a track adjustable for wear. This section of the table has sufficient movement to edge or cut off material up to 35 in. wide. The moving table will open to permit the use of a 2-in. grooved head. By means of a handwheel the whole table can be tilted into an angle of 45 deg. and locked in position. A gage in the column registers the angle to which the table is tilted.

The motors are 5 hp. each for either 2- or 3-phase, 60-cycle, 110-, 220-, 440-, or 550-volt, a.c. circuits. A push-button station and magnetic switch are built in. Both motors are so interlocked that when one is in position and started the other is cut out automatically. Saw mandrels are $1\frac{3}{16}$ in. in diameter. The floor space occupied is 48 x 54 inches.

Holmes No. 14 Tilted Nut Tapper

A precision nut tapper that taps square with the face of the nut has been placed on the market by the



Holmes No. 14 Tilted Nut Tapper

Holmes Engineering Company, Oshkosh, Wis. According to the manufacturer, precision is due to four factors: First, the 30-deg. tilt of the machine permits the nut to lie squarely on its face without danger of tipping; second, the work-holding fixtures can be lined up with the spindles, and they are adjustable; third, the fixtures are self-cleansing, and, fourth, the carriages are counterpoised to eliminate error in lead.

The capacity of the machine is to 1¼-in. U. S. S. threads, production being 20 to 30 nuts per minute. Motor drive may be substituted for belt drive if desired. Nearly any kind of nut can be handled.

Davenport Universal Die-Holding Stand

Ease and rapidity of mounting dies and convenient working are important features of the universal die-holding stand placed on the market by the

Davenport Universal Die-Holding Stand

Davenport Locomotive & Manufacturing Corporation, Davenport, Iowa. The block may be set at any angle by means of the universal feature and also at any height by means of an elevating screw. The stand is built to accommodate blocks weighing up to 1,500 and 3,000 lb., respectively.

The universal head fixture is made of steel and is tilted by means of a handwheel operating through a worm and segment gear. The die is held firmly in place by means of two adjustable clamps, one on either side. These clamps are fastened to the table by means of T-bolts engaging

T-slots in the surface. Any position can be achieved quickly by simply turning the handwheel until the desired angle is reached and then turning the entire top assembly which is completely pivoted. The work may be raised or lowered by means of a central handwheel, and is locked in position, thus minimizing the possibility of accident. The base is a circular one-piece casting provided with four holes for fastening.

REVIEW · OF · RECENT · PATENTS

Relating to the Machinery and Metal Products Industries

Processes

Fritz Ungerer, of Pforzheim, Germany, has been granted patent 1,723,098 on a method of straightening plates, which consists in subjecting the plate to static straightening pull and then shaking the plate while it is stressed.

The process of electroplating aluminum by using the material to be coated as a cathode, and an anode of aluminum, in an electrolite containing an aluminum salt of an amido-benzene sulphonic acid, is the subject of patent 1,723,277, assigned to the Oneida Community, Limited.

To the Electro-Metallurgical Co. has been assigned patent 1,723,922, on a method of treating copper to increase its strength by alloying with 2 to 5 per cent of cobalt, heating to a temperature above 850 deg. C., and quenching from that temperature.

Eugene Strasser, of Rorschach, Switzerland, has been allowed patent 1,724,624 on a process for producing aluminum castings and molds for use therein, the mold being composed of a mixture of sand and finely divided copper ore.

The Atlantic Service Co. is assignee of patent 1,724,717, on the method of making cutter plates for grinding machines, which involve temporarily fastening a hard metal backing plate to a soft metal disk, drilling the disk, tinning the plate and sweating them together under pressure, and finally grinding the surface of the cutter disk.

A method of grinding cylindrical objects is the subject of patent 1,722,388, assigned to Cincinnati Grinders Incorporated. The patent deals with a process of feeding pieces successively through a centerless grinder.

The Hess-Bright Manufacturing Co. is assignee of patent 1,722,494 covering the art of forming matchable antifriction bearings, which involves grinding one face of one race while the bearing is carrying an axial load.

An electric arc-welding method involving the dissociating of carbon dioxide in the presence of hydrogen and welding in an envelope of the resultant gaseous mixture, is covered by patent 1,717,530, assigned to the General Electric Company.

A process of making hollow rod by casting an ingot around a metal tubular member and then elongating and reducing the cross-section of the resultant ingot, is the subject of patent 1,718,210, assigned to the Ludlum Steel Company.

To the Gleason Works has been assigned patent 1,722,464, relating to a method of and a machine for generating bevel gears. The method involves rolling a gear segment in a yieldable crown gear, thereby imparting cutting movement to a tool.

Samuel F. Tapman, of Jamaica, N. Y., has secured patent 1,721,263, for a riveting process in which the work and rivet are heated, and the rivet forced through the work and clinched.

Patents 1,721,350-1, assigned to the American Rolling Mill Co., relate to an apparatus and method of continuously annealing steel strips. The apparatus comprises flattening rolls, heating chamber, cooling duct, and means for moving the strip through these elements while controlling the degree and continuity of annealing. The process includes a deoxidation of the surface of the strip while it is hot.

Metal-Working Machinery

Robert K. Barry and Leonard Bowen, of Muscatine, Iowa, have been granted Patent 1,722,263 on a hardness testing machine, with means for gradually applying pressure to a penetrator.

A machine for casting pistons is covered by patent 1,722,371, assigned to the Aluminum Company of America. The machine includes a plurality of core-forming members arranged for successive registry with a mold.

Patent 1,722,387, assigned to Cincinnati Grinders Incorporated, deals with a centerless grinding machine having two wheels and means for guiding work into and out of contact with said wheels.

The Western Electric Co. is assignee of patent 1,722,421 covering a wire-drawing machine that comprises a guide, a stepped drawing roll, a die block, a friction clutch, and other co-operating members.

A riveting machine, having an adjustable anvil, a tool turret, and a double-toggle means for operating the turret, is the subject of patent 1,722,530, assigned to the Manley Manufacturing Company.

To the Pratt & Whitney Co. has been assigned patent 1,722,544 on a gear-finishing machine having an oscillating frame, an indexing spindle, a cam-controlled toolhead, and other co-operating parts.

Steel and Tubes, Inc. has been assigned patent 1,722,711, relating to a butt-seam tube-welding machine for selectively varying, during the welding process, the pressure between the electrodes and the work.

TRADE PUBLICATIONS

BATHS, ELECTRIC OIL AND SALT. The Despatch Oven Company, 116-122 First Avenue, North, Minneapolis, Minn., has published a bulletin entitled "Electric Oil and Salt Baths," which shows the line of electric oil and salt baths which are manufactured by the company.

CHUCK, DRILL. The Eastern Tube & Tool Company, Inc., 594 Johnson Ave., Brooklyn, N. Y. has published a catalog entitled "The New Ettco Portable Drill Chuck." The catalog contains photos and phantom views of the Ettco Portable Chucks, together with tables of supplementary information. Sixteen 6 x 9-in. pages compose the book.

SHEARS, PUNCHES, AND PRESSES. Henry Pels & Co., Inc., 90 West St., New York, N. Y., has published catalogs MB-29 and SP-29 on combination shears and punches, and heavy shears and presses, respectively. Both catalogs give specifications, constructional features, and pictures. Each contains eight 11x8½ in. pages.

DEVELOPMENT, INDUSTRIAL. The Metropolitan Life Insurance Co., 1 Madison Ave., New York City, has published a booklet numbered 10256, entitled, "Industrial Development in the United States and Canada in 1926 and 1927." The booklet is a summary of a survey made by a committee of the National Electric Light Association and the Metropolitan Company. Pertinent data regarding industrial development is given. The booklet contains twelve, 5½ by 7½-in. pages.

NEWS
OF THE WEEK

National Machine-Tool Congress Breaks All Records for Attendance

Overflow of exhibitors established outside—More than 125 new machines on exhibition

OPENING with a record-breaking attendance on the first day, the National Machine Tool Congress set new high records in space occupied by exhibits, number of exhibitors, number of new machines, and elaborateness of presentation. More than 125 new machines, largely lathes, drill presses, grinding machines, and similar high-production equipment, were placed on display by the 244 exhibitors in the auditorium and annex. Several of the 65 or more concerns that were unable to obtain space within the exhibition halls rented space near the Public Auditorium, and are holding their exhibits there.

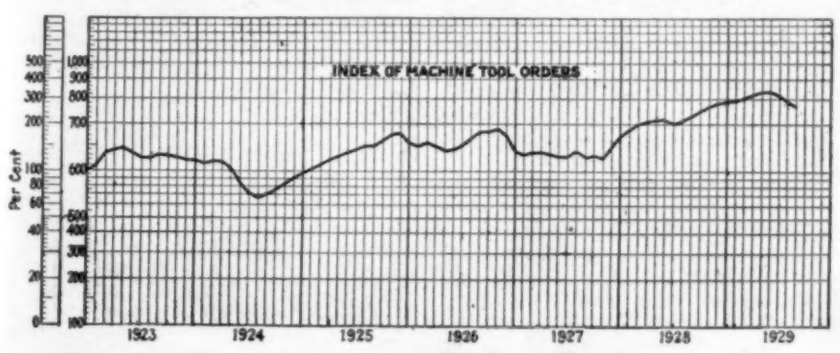
More than 15,000 engineers and executives are expected to attend the Show before it closes this weekend, in spite of the fact that restrictions have been placed upon attendance so that those merely sightseeing are not admitted to the halls. An unusual amount of interest has been displayed, both by exhibitors and visitors. Practically no company of importance in the metal-working field has missed having from one to ten men at the Show, the General Electric Co. having 60 men in attendance from Schenectady alone, and Pratt & Whitney having 52 men there on a special trip. Exhibits required 400 cars for transportation to the Show. The total expense involved is said to run closed to $500,000. Many of the newly designed machines on exhibition are running daily on production operations to demonstrate the type of work for which they are fitted. For instance, certain makers, notably Kearney & Trecker Corporation, are exhibiting new machining jobs on airplane parts and equipment, a market which has developed during the past year. All-in-all, predictions are that the Show will be a huge success and will add considerably to the engineering and economic prestige of the machine-tool and machinery industry.

* * * *

August Machine-Tool Order Volume Shows 25 Per Cent Increase

FOR a number of months past, the machine-tool industry has enjoyed a high level of demand for its products, even to the extent of postponing materially the usual summer let-down, which this year did not become apparent until July. Compared to the previous month, August orders have made another good record, according to Ernest F. DuBrul, general manager of the National Machine Tool Builders' Association. Based on a preliminary tabulation of reports received at the Association office, the index of machine-tool orders will approximate 300 for August, as compared with 258 for July, and 241 for the same month of last year.

The three months' average indicated on the chart dropped off slightly from that of last month. The index number for August, is 286, while that for July, was 294.8, and that for August, 1928, was 219.9. The index of shipments this month was 276.9, as compared with 278.1 for July. The index of unfilled orders was 692.5, as compared with 694.1 for July.



At 300, the index is down 11 per cent from the peak of 336 attained in February of this year, but even so, machine-tool plants have in the main been operating overtime to catch up on the unfilled orders which are still about 2½ times the current rate of shipments. New designs have stimulated sales, and in some cases, the production capacity in some shops is not enough to supply the wants of their customers. Owing to the shortage of labor, there are numbers of idle machines that cannot be put to work because men of the proper skill cannot be found to operate them.

The scarcity of skilled workmen is a very definite limiting factor upon production at this time. From day to day, the introduction of more automatic machinery releases men for other work, but the men so released cannot all fill the kind of jobs that are waiting for them in other lines. Unskilled labor suffers, therefore, while industry scours the cities for trained men and assistants.

* * *

Automobiles Lead Exports For First Half of Year

A new leader in America's export trade appeared during the first half of 1929 when the automobile took first place from cotton, the undisputed leader since the Civil War. This is shown in a review, "Our World Trade," issued by the Foreign Commerce Department of the Chamber of Commerce of the United States. Exports of automobiles, parts, and accessories for the first half of the year totaled $339,160,000, an increase of 36.4 per cent over those of the same period a year ago. At the same time, exports of raw cotton, amounting to $319,821,000, declined 13.9 per cent in value as compared with the exports in the same period a year ago.

A number of important changes are taking place in America's export trade. For example, during the six months period, finished manufactures constituted 52.3 per cent of the total exports, indicating that the United States no longer relies on its natural resources to maintain its excess of exports. During the first half of the year, exports of finished manufactures increased 22.6 per cent, while exports of crude materials, on the contrary, declined 10 per cent.

Some of the most striking gains among the finished manufactures were made by machinery items. Several of these items with their standing among the first fifty leading exports are as follows: Agricultural machinery and im-

plements, ranking fifth, gained over 33 per cent; electrical machinery and apparatus, ranking sixth, gained nearly 28 per cent; while power-driven metal-working machinery, ranking twenty-fourth, gained 41 per cent; and construction and conveying machinery, ranking thirtieth, gained nearly 12 per cent.

* * *

Swiss Machinery Trades Gain in Importance

In general, the Swiss machinery trades are prosperous. There has been a slowing down in the production of electric railway equipment due to the fact that the electrification scheme as worked out by the Swiss Federal Railways is approaching completion. The growth of exports of Swiss-made machinery is entirely creditable, particularly in a country where all raw materials have to be brought in, even to coal, though the latter is today largely replaced by the "white coal" of the hydro-electric plants. Exports in 1928 were 79,657 metric tons, valued at $36,000,000, as compared with exports of 62,526 tons in 1927.

The machine-manufacturing industry leads among the large employers of labor. There are 628 plants working and transforming metals and 759 which are specifically classed as manufacturers of tools and machinery. In 1900, there were employed of all classes of labor, 318,800; in 1910, 380,189, and in 1926, 473,304. Daily wages in general advanced from 6.36 francs in 1913 to 12.58 francs in 1928, approximately from $1.27 to $2.52. Metal manufacturing plants, many of them of greatly increased magnitude, have increased 32 per cent in number since the beginning of the century. The machinery industry, taking it in its widest application of production and application, is centered chiefly in Zurich, Oerlikon, Winterthur, Horgen, Baden, Arbon, Schaffhausen, Geneva, Basle, and the environs.

* * *

Army to Demonstrate Latest Mechanized Equipment

Mechanized field equipment developed by the U. S. Army during the past year is to be shown to leading engineers and industrial executives of the United States at Aberdeen proving ground on Oct. 10. During a day-and-night program of massed firing and maneuvering by the mightiest weapons and most modern battle equipment yet developed, the new 50-mile-an-hour tank, and several other new types of motive equipment will be shown. Over 5,000 members of the Army Ordnance Department and affiliated engineering societies and organizations are expected to be present at the demonstration. New battle tanks, guns, trucks, and self-propelled field guns will be included in the demonstration.

Imported Goods Supply Increased Canadian Demand

During 1928, more money was spent in Canada on agricultural machinery than was spent in the preceding year, according to a statement just issued by the Dominion government. This increase in demand was supplied largely by imported goods, as lower levels were reported for Canadian-made products. Production values in 1928 dropped to $41,199,841 from $42,996,288; exports, including re-exports, declined to $14,560,412 from $16,559,806; while imports advanced to $39,893,490 from $26,101,338 in 1927. A calculation made by deducting the exports from the sum of the production and the imports shows that the apparent consumption of agricultural machinery rose to $66,532,919 in 1928, as compared with a corresponding figure of $52,537,820 in 1927.

* * *

Pratt & Whitney Sends 52 Men to Show

The Pratt & Whitney Co., Hartford, Conn., is sending 52 of its executives, engineers, and foremen to Cleveland for two days to visit the National Machine Tool Builders' Exposition. The purpose of the trip is to give these men a first-hand opportunity to study the latest developments in machine tools, small tools, and gages. The men will board two pullman sleepers reserved for them at 5 p.m. Sept. 30, and will arrive in Cleveland the following morning. The cars will be placed on sidings close to the exhibition buildings, and will be used for living quarters during the stay of the men.

* * *

Industrial Exposition Planned in Chicago

Final arrangements have been completed for the first showing of the National Industrial Exposition in Chicago from March 3 to 7, 1930. The location will be the new Exhibition Hall of the Hotel Stevens. The exposition aims to feature displays embodying services and equipment of companies and manufacturers wishing to cover the field of industrial production.

* * *

Bearing Survey Shows Need For Further Simplification

A survey for the year 1928, conducted by the Division of Simplified Practice of the Department of Commerce, in the interests of Simplified Practice Recommendation No. 67, covering roller bearings, has resulted in a consensus of opinion that further standardization is necessary. The three major manufacturers answering the questionnaire listed 58 per cent of their production as already standardized. Another manufacturer reports that new equipment is almost universally selected from the simplified practice recommendations, although they find it necessary to continue with a large number of sizes previously made for service requirements, and also present production models of equipment of old design. They agree that manufacturers are supporting the design simplification insofar as they are able.

* * *

Chevrolet Motors Makes Appointments

R. W. WHITE, formerly general sales promotion manager and recently Atlanta zone sales manager of the Chevrolet Motors Co., has been appointed advertising manager, succeeding J. E. GRIMM, JR., who has been summoned to General Motors. M. D. DOUGLAS, formerly assistant general sales manager, has been appointed general parts and service manager, to succeed J. P. LITTLE, who goes to General Motors. J. C. CHICK, regional sales manager at Flint, has been brought to the central office to assume Mr. Douglas' place as assistant sales manager. C. L. ALEXANDER, Chicago zone sales manager, will go to Flint to succeed Mr. Chick. R. L. MYERS will succeed Alexander.

* * *

European Editor to Visit American Plants

I. William Chubb, editor of the European edition of the *American Machinist*, arrived on the *Adriatic* on Oct. 1, for a visit of several weeks in the United States. He is visiting the Cleveland exposition of the National Machine Tool Builders' Association, and will also spend some time visiting the more important manufacturing plants near Cleveland, Dayton, Cincinnati, Detroit and Pittsburgh, and possibly, in New England before his return to England.

* * *

AT THE election of officers of the Association of Railway Supply Men, E. H. Weaver, Westinghouse Air Brake Co., was elected president, and J. W. Fogg, MacLean-Fogg Lock Nut Co., secretary-treasurer. The new executive committee consists of: J. Will Johnson, Pyle National Co.; R. T. Peabody, Air Reduction Sales Co.; Fred Ehredt, Nalhan Manufacturing Co., and Roger Q. Milnes, Dearborn Chemical Company.

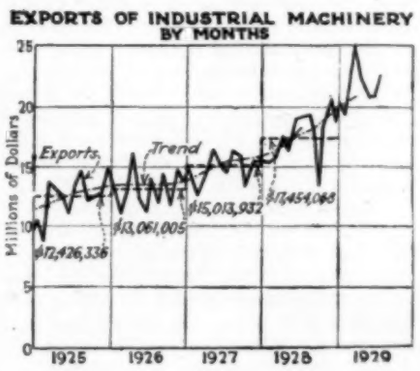
* * *

TWO huge Zeppelins which the Goodyear-Zeppelin Co. will begin soon for the U. S. Navy, will be considerably larger than the Graf Zeppelin, and each ship will have room inside its gas bag to house five airplanes, to be taken aboard and released by a special mechanism while the ship is in motion.

Exports of Industrial Machinery Continue Upward Trend

THE upward trend in exports of American industrial machinery, which has been evident since May, continued during July with total foreign sales of nearly $23,000,000, according to L. J. Cochrane, of the Industrial Machinery Division of the Bureau of Foreign and Domestic Commerce. This represented an increase of approximately $2,000,000, or 10 per cent over the preceding month and of about $4,000,000, or 22 per cent over July, 1928. The figures for the first seven months of 1929 showed that during that period American exporters sold machinery abroad valued at more than $152,000,000, or over $31,000,000 in excess of the sales for the first seven months of 1928. Moreover, this raises the monthly average for the first eight months in 1929 to $21,748,000, as compared with an average of $17,252,000 in 1928.

Among the principal items, exports of well and refinery machinery showed the most outstanding gains during the first seven months of 1929, as compared with the corresponding period of the previous year, closely followed by metal-working machinery. Substantial gains were also made by foreign sales of internal combustion engines, power



pumping equipment and construction and conveying machinery, but business in steam engines fell rather sharply, while foreign shipments of waterwheels and water-turbines dropped from over $560,000 during the first seven months of 1928 to only slightly over $97,000 in the first seven months of the present year.

Foreign demand for American metal-working machinery continued strong and sales during July were 13 per cent over the sales of the corresponding months last year. The sharp increase in foreign deliveries of this item, however, is best indicated by the figures for the first seven months of 1929, which show a total of over $24,000,000 as compared with a total of $18,000,000 during the same period of 1928. While business in this line has been generally good, sales of certain items, such as engine lathes, turret lathes, gear cutting machines, pneumatic portable tools, planers and shapers, and internal grinding machines, have shown outstanding gains, and exports of sheet and plate metal-working machinery, foundry molding equipment, rolling mill machinery, and forging machinery have almost doubled.

* * *

American Machinist Directs Show Visitors to Exhibits

An electrically lighted diagram of the floor plan of the National Machine Tool Builders' Show at Cleveland was utilized by the *American Machinist* in directing visitors to booths of various exhibiting companies. Plugging into a small socket beside the name of any exhibitor in the alphabetical list caused a lamp to light beneath the point designated as the booth of the exhibitor. The various aisles on the diagram were designated in red, and the booth of the *American Machinist* was designated in green for the convenience of the visitors. The device was so constructed that four separate booths could be indicated at the same time, thus giving the visitors rapid service. Approximately 280 circuits were used in the apparatus.

* * *

THE Screw Machine Products Association held a meeting at the Hollenden Hotel, Cleveland, on Tuesday, October 1. The session was taken up with reports of what the Screw Machine Products Institute has accomplished since its organization last January.

* * * *

Washington Looks at French Steel-Making—Blame Auto Changes for Slow Business—Are Soviet Workers Being Gypped?—Autos and Radios

By Paul Wooton

Washington Correspondent, American Machinist

WASHINGTON, D. C., Oct. 2.—When France took over a large steel-making capacity from Germany, she found some difficulty in disposing of all of it. To provide a market, systematic steps were taken to stimulate manufacture of machinery, with the result that France has become a much more important factor in the world trade in machinery. Incidentally, she is exporting her steel in the form of highly refined products and is profiting in several directions as a consequence.

Some price cutting and over-zealous efforts to land orders are seen as indications that fall business is not accelerating to the extent that had been expected. Changes of models in the automobile industry are blamed for part of this. Heavy railroad buying, however, is expected to fill the gap soon.

Early collapse of Soviet control of affairs in Russia, once so freely predicted, no longer is expected. Modification of the original plan has gone on apace and further modification may be expected, but the position of the existing regime apparently is bomb-proof, even in a country where they know how to get results with bombs. Every consideration is being shown the worker in providing facilities at plants for his comfort and convenience. There are pensions and sick benefits. Evidently, however, these measures have not stimulated efficiency. Cost of manufactured articles usually exceeds the price at which the corresponding imported article could be sold. In an effort to overcome flagrant carelessness, workers thus are being penalized for the nice things they receive.

Breaking down its figures obtained from a national survey of radio sales, The Commerce Department has found that 40½ per cent of the volume was handled by Simon pure radio dealers, i.e., those who indicated that their prime source of revenue was derived from the sale of radio equipment. The remaining portion of the business was distributed through a diverse assortment of outlets—farm implement dealers, plumbing establishments, cafes, confectionery shops, and grocery stores.

Automobile dealers have reported eight per cent of the business during the three-month period in which the study was made. Apparently, General Motors had its eyes open when the Northeast Electric was purchased two weeks ago. Radio sales are at the peak when automobiles are selling but poorly.

While it is a long way from the appointment of a committee to the accomplishment of what it may recommend, not a few European specialists are taking seriously the United States of Europe proposal. Much can be said of inherent animosities and racial differences, but it is pointed out that much emotion can be squeezed out of a situation if the economic gain is sufficient. The effect on American business of the development would be far-reaching. The United States of Europe would have a home market four times as large as has the United States of America. It would embrace one of the most richly endowed areas on the sphere. Europe as a whole is rich in fuel, in waterpower, minerals and in fertile agricultural lands. It already has a well-developed machinery industry in the central portions, and has great facilities for mass production.

BUSINESS BAROMETER

Clairvoyance of collective mind foresaw advance in London bank rate and its depressing effect in America

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

AN EXPLANATION of the decline on the Stock Exchange and the dullness of commodity markets is the clairvoyance of the collective mind which foresaw the advance in the London bank rate and the astonishing rise in brokers' loans in New York, as well as the depressing effect of these developments after they were announced. As yet it cannot be said that there is any radical change in the feeling which pervades the stock market, but people seem more disposed to look before they leap, and there is less disposition than formerly to act blindly on "tips."

In the field of high finance, the outstanding feature has been the issuance of investment trust stocks or trading company shares. A minimum capital of a hundred million dollars seems to have become necessary in order to secure popular recognition and distribution for these issues. That they can be sold at all at a time when call money is loaning at 9 per cent is a wonder, and there are some skeptics who profess to doubt whether the demand for them is as wide or as great as the prevailing quotations indicate. Of the facts, only the insiders have an accurate knowledge, and they won't tell. But it seems probable that the history of the present financial era when written will show that the control of many large industries has been acquired through the medium of the investment trust. The attitude of the public toward this control is as yet unknown, but it is possible that the politicians may try to inflame the antagonism toward capital that is always latent in this country, and some wiseacres profess to see danger in that phase of the situation.

This is one of the clouds in an outlook that cannot be called wholly bright as long as such high rates are being paid for money with which to carry stocks.

It is claimed that the public has become accustomed to these high rates, and they no longer influence prices. This may be true emotionally, but the end of the year is approaching, and only those who are entirely without any mathematical sense will be cheered when they find that it has cost them 10 per cent per annum to carry stocks that have yielded an income of less than 5 per cent upon the purchase price.

For this reason, a few of the more conservative bulls have been disposed to liquidate their investments, and the time is coming when brokers' loans ought to show some decrease. But for the present they are still expanding and last week the New York Reserve Bank reported that its member banks' loans to brokers increased $192,000,000, which is the sixth successive huge weekly increase. The loose capital of the world is being attracted to New York by the high rate that call money commands on the Stock Exchange, and last week the Bank of England was compelled to protect its rapidly dwindling gold reserves by advancing its rate to 6½ per cent.

This is a situation whose bearishness possesses an accumulating force, and its significance ought not be obscured by overstressing the corrective effect of the rate advance, for all precedents suggest that liquidation is the inevitable and the only effective correction.

In this country, business has been good, but it has fallen below last year's record in some of the major industries. While wholesale and retail trade is active, there are some indications of a reduced turnover in certain lines. Steel ingot production is below the level of a year ago for the first time this year, and price weakness is evidence that buying, except for railroad needs, is quieter.

The output and sale of automobiles has dropped off from the summer level, and the fourth quarter is expected to be quiet. A great many used cars are on the market, and it is said that they constitute the dealers' chief problem. The export trade in automobiles, however, is remarkable. The value of the cars shipped during the first six months of 1929 exceeded that of our cotton exports for the same period. These figures really suggest a "new era," as cotton has always led our export trade by a wide margin, and cotton exports have approximately represented the usual balance of trade in our favor.

Sugar is upheld by the firmness of the Cuban single seller and varied reports of setbacks to the growing crops. The grains have been stronger, but many of the other staples, including rubber, silk and hides, are easier and as a whole the commodity markets are so stabilized that trading is apathetic.

The British Premier, Ramsay MacDonald, is on the sea en route to Washington where he will be President Hoover's guest at the White House. These two leaders of the English-speaking peoples are expected to hold a conference that will be fraught with tremendous significance for humanity, and the world waits eagerly for an announcement of their views and conclusions.

If the auguries indicate that the present generation intends to insist that civilization and peace are synonymous terms, then it will be hard to limit the world's economic development, although it may be checked temporarily from time to time by periods of tight money similar to the one through which we are now passing.

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From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

ANTICIPATING a flood of orders after visitors at the National Machine Tool Builder's Exposition have had an opportunity to make a report of what they saw there, dealers and manufacturers have expressed only a little disappointment in the slight falling off in sales which many of them experienced during the last few days preceding the Show. Some dealers report September a better month than August, in spite of the Show. The opinion is rather general, however, that if the Show were held once every three years instead of every two, both manufacturers and users would benefit from the increased time spent in preparation.

NEW YORK business is spotty, with some manufacturers reporting increased business, and some reporting a falling off. Chicago conditions are also unsettled, as are those in New England. These three districts are unanimous in expecting better conditions after the Show. Canadian sales and inquiries are holding up well, with business activity generally high. Cincinnati reports September sales greater than those in August, and a good outlook for the fall, but Detroit markets are slow.

PRICES, generally, are about the same, and deliveries have indicated but little tendency to improve. Used machinery is going well, when machinery modern enough to satisfy buyers is obtainable. The railroads and the electrical industry are showing most interest at the present time.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW YORK

A slight pick-up toward the end of the week reported by several machinery and machine-tool dealers and the purchase of 42 additional oil-electric freight locomotives costing $5,000,000 by the New York Central, were the only outstanding events of the "week before the Show" in New York. Sales on the average were slow, and a great deal is expected of the approaching Machine Tool Show as a factor in increasing fall business. Some orders have been placed before the Show, subject to their approval after the machines have been seen there for machines which up to the present have appeared only on paper.

If experiences are to be repeated, it will be some weeks before the full value of the Show can be measured in orders. Many responsible dealers and manufacturers have expressed the regret that the Show is taking place at a time when manufacturers are so pressed to fill orders. Shipment of machines for replacement purposes are more important than those for expansion at present, and as a result, new equipment orders are falling off.

One delivery improvement was noted during the week, that on a power hacksaw. Other delivery dates are being maintained about the same, and prices are also remaining stationary. Some dealers and manufacturers are advocating a show every five years instead of every two, while the more conservative advocate a change from a bi-annual Show to one every three years. Buying is not limited to definite industries, but is scattered, and largely for small replacement items to maintain production schedules.

INDIANAPOLIS

The local machinery and machine-tool trade has nothing about which to complain, judging from the manner in which fall business has opened up. From virtually every possible source, the demand is increasing, and present indications point to one of the best fall seasons this area has had for some years. In the first place, the railroad demand is broadening. Lines which have big shops in this state are employing more men, and the situation is healthier than it was a couple of months ago.

Demand from radio manufacturers is very heavy. Orders for both electrical equipment and for cabinet work have been booked that assure a heavy business during most of the winter.

Demand for garage equipment is good, with small lathes, grinders, sheet-metal machinery, and similar equipment coming in satisfactorily.

The coal industry of the state is awakening after a summer's somnolence and the last two weeks have seen several good orders for replacements and some new installations to make possible increased production. The aviation industry continues to be a bright spot with the trade. New hangars and machine shops are being installed almost weekly, and those already installed are being enlarged. Leaders of the trade here predict that the next two years will see a remarkable expansion in the trade from this one source alone.

NEW ENGLAND

New England machine tool business proceeded at only a moderate level during the week. Orders were apparently of a routine nature and called mostly for single units. Inquiry has held up well, however, and a brisk activity should follow the conclusion of the Cleveland Show. Foreign prospects are reported as particularly bright, and new closings are anticipated. The demand for used equipment is good, but dealers are hard pressed in many instances to get the type of machine desired. Lathes, milling machinery and grinding equipment top the demand in this territory.

CANADA

Machinery and machine-tool sales in Canada are holding up remarkably well, and inquiries indicate a good volume of business during the last quarter. Much of the present demand is coming from the mining, pulp and paper, and electrical supply industries, all three of which have been unusually active during the past six months. Automotive requirements have fallen off slightly in the last month. Aeronautical tool requirements are on a large scale and have been increasing steadily.

Iron and steel plants are still well employed. New orders received within the last fortnight by the Algoma Steel Corporation for rail business have greatly improved the company's outlook. There is now sufficient business on hand to keep the rail mills working on single shift until the end of November, by which time the railways will have their winter booking for 1930 well in hand. The two merchant mills have been closed down to allow the company to carry out plant extensions.

Business of the Dominion Engineering Works has been maintained at a high peak during the last three months, and, despite additions to plant capacity, and the acquisition of the Walmsley Works, production facilities are being taxed to the limit. Demand for hydraulic machinery has been a big factor in the company's production program.

Demand for agricultural machinery in Eastern Canada continues very active. The Massey-Harris Company reports that the volume of prospective business is as large as the amount actually done two years ago, when conditions were prosperious.

The construction industry is still creating records. Building permits issued during the first eight months of the year reached a total of $168,606,059, or 16 per cent above the previous high record of 1928.

CINCINNATI

The great majority of the machine-tool manufacturers of the Cincinnati district report that their September sales were much larger than in the same month of the previous year. In some cases sales dropped below August, however, due to a slight recession that occurred during the past week. This lull is attributed to the fact that many users have postponed buying until after the close of the National Machine Tool Builders' Exposition in Cleveland.

Selling agents report a gain in September, as compared to the same month of last year, but there was a small loss of business compared to August. One member of this branch of the trade stated: "Business is still at a better-than-fair level, and there is every indication that after the machinery exhibit is over there will be a general livening up of the market in local and adjacent territory."

Among the statements made by manufacturers were the following: "We made a slight gain in the past month, comparing it to the previous one, and we made a substantial gain over the same month of last year." "Business is at a very good level at present and the demand is very much larger than it was a year ago." "September sales were somewhat larger than August sales, and in both months a gain was made over the corresponding period of the previous year."

The sustaining feature of the week's market was the sale of single pieces of equipment to small users, but here and there an order called for two or three tools. The buyers were located in all sections of the country and their purchases were well diversified. Inquiries for single tools flowed in freely during the week, likewise from all sections of the country.

CHICAGO

The closing days of September find the machine-tool market in a somewhat unsettled condition. Inquiry among manufacturers' representatives and distributors regarding the present status of business, as indicated by the volume of sales, discloses a situation not wholly to be accounted for by the forthcoming Machine Tool Builders' exposition, although it is generally conceded that many prospective buyers are holding off until they shall have had the opportunity to inspect the new, or greatly improved, tools to be displayed and demonstrated. The belief prevails that, the Show over, there will be renewed buying activity along machinery lines, and that such recession as has been experienced during the last two weeks will be more than offset by the volume of October sales. Present buying, as for some time in the recent past, is from widely scattered sources, minor industrialists and machine shop owners accounting for the bulk of bookings. Some of the western railroads are reported to be preparing their 1930 budgets with a view to the inclusion of a large quantity of shop equipment, and this is taken as grounds for the belief that railroad buying next year will exceed that of this year by a large margin.

DETROIT

With the slowing up of production in the automobile and associated industries here, the demand for machinery and machine tools has diminished considerably.

During the past ten days, the market here has been depressed to a point that is causing concern in some quarters. Some of the dealers have been doing a fairly good business, however. Few inquiries of importance have been received within the past two weeks, and there is no indication now that business will improve in the immediate future. Almost without exception, automobile manufacturers have curtailed production and there seems little likelihood that they are planning to increase their output soon.

At present there is only one major expansion in progress in the automotive industry. This one involves the change from a six- to an eight-cylinder motor, and a fairly large volume of machinery has been purchased.

During July and August, it was generally believed that the fall months would be unusually productive in almost all lines of business and industry. Machinery and

equipment sales reached a very low level as compared to the first half of the year. September did not come up to the expectations of the dealers here and there is little promise that conditions will change immediately.

Business in general is only fair and an increasingly large number of men are unemployed. The atmosphere of optimism that has predominated here for all of the months until September is not so apparent now. Whether this is significant cannot be determined, but it is certain that people are not making or spending as much money as they did earlier in the year.

* * *

World Congress Delegates Tendered Farewell Dinner

European and American delegates to the coming World Engineering Congress in Tokyo were tendered a farewell dinner on Sept. 26 at the Hotel Astor, New York City, by the members of the American engineering societies and affiliated organizations.

Among the speakers were: Dr. Frank Gill, past president, Institution of Electrical Engineers, London; Senator Luigi, Luiggi, honorary member of the A.S.C.E. and member of Institute of Civil Engineers, Rome; Gano Dunn, president of the J. G. White Engineering Corporation; and Elmer Sperry, president of the A.S.M.E. Many of the delegates will leave for San Francisco by special train on Oct. 2, stopping at Washington, Chicago, the Grand Canyon, and Los Angeles. In Washington, the party will be greeted by President Hoover and entertained by the Japanese Ambassador.

Business Items

The Westcott Chuck Co., 118 East Walnut St., Oneida, N. Y., is maintaining an exhibit at 640-642 St. Clair Ave., Cleveland, adjacent to the Auditorium, because of lack of space at the Show.

John H. Bryan, 50 Church St., New York, has been placed in charge of sales in the metropolitan district of New York for Bliss & Laughlin, Inc., Harvey, Ill. The Denyven, Linn Co., 250 Stuart St., Boston, has been appointed sales representative in the New England States for cold-drawn steel and shafting. These two branch offices follow close upon the appointments made last June for the Philadelphia office in charge of William I. McGonigal, 1015 Chestnut St., and for the Cleveland office under direction of George A. Spaulding, 1436 Engineers National Bank Building.

The Horace E. Dodge Boat & Plane Corporation, Detroit, has acquired 100 acres of the Hampton Roads tract which was formerly the site of Camp Stuart. The company plans to erect several manufacturing units for the large-scale manufacture of motor boats, flying boats, and amphibian airplanes. When completed, the plant will employ upward of 2000 persons.

Expansion of the parts and service plant of General Motors of Canada, Ltd., Oshawa, Ont., is indicated in the announcement made by H. A. Brown, vice-president and general manager, that it is proposed to erect a three-story building with floor space of 87,000 sq.ft. Mr. Brown anticipates that construction will start shortly and that the building will be completed about Jan. 1, 1930.

The Skinner Co., Ltd., Gananoque, Ont., subsidiary of the Houdaille-Hershey Corporation, Detroit, has awarded a contract for the construction of a plant. The contract price is in the neighborhood of $200,000. Excavation work will commence shortly. This unit will be 127 x 416 ft., and one story in height.

The Van Dorn Electric Tool Co., Cleveland, Ohio, is now using an electric tool demonstration car to assist jobbers' salesmen in demonstrating various Van Dorn tools in operation. The car consists of a closed body having a large rear door, which, when opened, shows the various electric tools accessible for immediate use.

American Cirrus Engines, Inc., subsidiary of Allied Motor Industries, Inc., began removal recently from its plant in Belleville to Marysville, Mich., where a plant, providing 235,000 sq.ft. of floor space in two 3-story brick buildings, has been constructed. The plant covers 150 acres, and has a frontage of $\frac{3}{4}$ mi. on the St. Clair River.

Industrial Welded Alloys, Inc., has acquired title to the former Titan steel plant, Lister Ave., Newark, N. J., and has begun alterations of the property. The plant consists of 4 acres and 75,000 sq.ft. of floor space in monitor-type buildings. The property fronts for 291 ft. on the Passaic River.

The Maryland Machinery Co., Baltimore, has been formed by T. H. King, and Wm. J. Leppert to sell machinery in Maryland, part of West Virginia, and the District of Columbia. Mr. King is president and Mr. Leppert is secretary of the company.

The Fokker Aircraft Corporation, Wheeling, W. Va., plans to erect a $300,000 factory at Los Angeles, where the work of constructing its 4-engined, 32-passenger transports will be concentrated. The new plant will be on a 33-acre tract adjoining the Alhambra Airport of the Western Air Express.

The Central Alloy Steel Corporation has completed construction and started operation of the largest nitriding furnace in the world at its Canton works, according to F. J. Griffiths, chairman of the board. The new furnace will be utilized to produce Nitralloy.

The Bethlehem Steel Co., Sparrows Point, Md., plans to break ground in the near future for the construction of six additional open-earth furnaces which will be completed about the middle of next year. They will comprise the third unit of this type.

A merger of the Western Gear Works, Seattle, Wash., and the Pacific Gear & Tool Works, San Francisco, has been announced, with a combined business of $2,000,000 annually. Under the merger, the Seattle company, with an annual output of about $750,000, will serve the Pacific Northwest division of the new corporation, which is to be known as the Pacific Gear & Tool Works. R. C. Frankie, president and treasurer of the Seattle company, will continue in charge of the Northwest division, with offices, as at present, at Ninth Avenue South and King Street.

The Continental Can Co. has acquired the assets of Sociedad Industrial de Cuba, S. A., the largest manufacturer of tin containers on the island, in Continental's first business venture outside of the United States, it was announced recently.

The Enamel and Heating Products, Ltd., has purchased the Albion Stove Works, Ltd., Victoria, B. C., which was incorporated in 1905 to take over the stove manufacturing business of the Albion Iron Works, Limited.

The Challenge Co., Batavia, Ill., will build a core room, west of its North River St. factory, Frank Snow, president, announced last week. The new unit will be two stories, brick construction, fireproof, and will cost $12,000.

The Pacific Coast Steel Co., San Francisco, added a new unit to its plant with the formal opening of a new bolt, nut and rivet plant on Sept. 12. The mill has a monthly capacity of 1,500 tons.

George Scherr Co., 142 Liberty St., New York, American representative of Schuchardt & Schutte, are maintaining an exhibit at 620 St. Clair Ave., Cleveland, during the National Machine Tool Builders' Show.

The Detroit Machine Tool Co., 5057 Woodward Ave., Detroit, Mich., recently appointed the Frank E. Artz Machinery Co., Chicago, and the Camm-Blades Machinery Co., Milwaukee, as distributors in their respective districts.

H. D. Conkey & Co., Mendota, Ill., are building an addition to their plant which will make possible the doubling of their capacity. The addition is to be used for the fabrication of materials.

Thomson Products, Inc., Cleveland and Detroit, has purchased property in St. Catherines, Ont., for the immediate erection of a factory with 25,000 sq.ft. of working space.

Formation of the Hamilton Machine & Manufacturing Co., Hamilton, Ont., has been announced. The company will be under the management of Truman N. Norton.

Equipment is being placed for the Traction Foundry & Machine Co., La-Porte, Ind., in an industrial building which has been unoccupied during the greater part of the last ten years.

The Stanley P. Rockwell Co., Hartford, Conn., has recently completed a new building for heat-treating and servicing at 296 Homestead Ave., Hartford.

Personals

PRICE M. DAVIS, who has been general manager of the Shadbolt & Boyd Co., Milwaukee, for many years, has been elected president to succeed Frank R. Ellis, who retired on Sept. 15 after having been associated with that interest for 55 years.

J. J. MCKEEN is superintendent of the new Linde Air Products Co. oxygen plant located at 1628 Cascade St., Erie, Pa., which commenced operations on Aug. 21. Mr. R. S. Hamilton, whose headquarters are at the East Buffalo Linde plant, is district superintendent.

FRANZ BOEHM of Boehm & Böhrmann, machinery manufacturers of Berlin, Germany, and HANS BILLETER, of Billeter & Klunz, Aschersleben, near Leipsic, Germany, are visiting in this country and attended the National Metals exposition at Cleveland.

MAURICE E. BROWN, for several years with the Union Malleable Iron Co., East Moline, Ill., for the last several years foundry foreman, has resigned to become salesman for the Arcade Manufacturing Co., Freeport, Illinois.

OTTO ABRAHAMSON, for 20 years treasurer and in charge of sales of the Beaudry Hammer Co., Inc., Boston, has been appointed to be in charge of sales for the Moloch Foundry & Machine Co., Kaukauna, Wisconsin.

W. S. RAWLEY has been appointed sales representative in Indiana and Kentucky of the Oliver Machinery Co., Grand Rapids, Mich. Mr. Rawley will have headquarters at 776 Emerson St., Indianapolis.

PERRY W. OLIVER, associated with the Sullivan Machinery Co., Chicago, since 1914, and for the past eight years with its El Paso, Texas, office has been transferred to San Francisco to succeed the late Ray P. McGrath as manager.

F. W. PETERS has been appointed district manager of the transportation department of the Central District of the General Electric Co., at Chicago, succeeding G. Hall Roosevelt, resigned.

DR. C. R. WOHRMAN was recently named recipient of the 1939 Henry Marion Howe medal of the American Society for Steel Treating at the annual banquet of the society in Cleveland.

EMIL DUKES, Gears & Forgings, Inc., Cleveland, Ohio, will present a paper on "Worm Gears" at the coming convention of the American Gear Manufacturers' Association in Philadelphia.

JAMES S. MURRAY, 392 Hazel Drive, Pittsburgh, Pa., has been appointed representative of the Siewek Tool Co., Detroit, in the Pittsburgh territory.

DR. ADOLPH FRY, director of the Krupp Steel Works, Germany, and head of its research activities, was a visitor at the National Metals Exposition at Cleveland, Sept. 9 to 13.

F. G. HAUSMAN, factory superintendent of the machine division of the Peck, Stow & Wilcox Co., Southington, Conn., has been invited to membership on the advisory committee to assist the State Board of Education in foundry training in the state trade schools and factory classes.

E. C. MENDLER has been placed in charge of the recently reorganized parts department of the Studebaker Corporation, South Bend, Indiana.

ARTHUR W. THOMPSON, formerly president of the United Gas Improvement Co., has been elected chairman of the board of the McKinney Manufacturing Co., Pittsburgh, Pa.

A. V. HALL, chairman of the safety committee of the Motor & Equipment Association, will address the eighteenth National Safety Congress, which will meet in Chicago this week.

M. SUZUKI, chief engineer, materials section, research office, Japanese Ministry of Railways, London, was a visitor at the National Metal Exposition in Cleveland from Sept. 9 to 13.

Obituaries

GEORGE M. JOHNSON, formerly superintendent of the Clinton, Mass., Works of the Wickwire-Spencer Steel Co., died at his home in Clinton, September 13. Mr. Johnson entered the employ of the Clinton Wire Cloth Co., in 1907, and when that company was merged with the Wickwire-Spencer interests he went with the latter organization. He was with the sales department at the time of his death. He was 36 years of age.

HARRY F. BAYLEY, formerly president of William Bayley & Sons, Milwaukee, died Sept. 17. He organized and became president of the Bayley Structural Iron Co., Milwaukee. He retired two years ago because of ill health. He was 62 years of age.

JAMES A. ROSS, retired president of the Ross Boiler Co., Chicago, died Sept. 16 at his home after a short illness. He founded the boiler company which bore his name in Chicago 41 years ago, and was president until he retired recently. He was 81 years old.

LOUIS VAUGHAN, president of the Taft-Pierce Co., Woonsocket, R. I., and auditor of the General Electric Co., died unexpectedly of acute indigestion on Sept. 26, at his home in Upper Montclair, N. J., at the age of 63 years.

DAVID CLAY WASSON, for many years general foreman of the Harrisburg Foundry & Machine Works, Harrisburg, Pa., died in his home in that city following an illness of four months. He was 61 years of age at his death.

THOMAS F. HOWE, who for 20 years had been connected with the sales department of the Interstate Iron & Steel Co., Chicago, died Sept. 18, in that city. He was 69 years of age.

NICHOLAS D. MAHER, retired president of the Norfolk & Western Railway, died at his home in Roanoke, Va., on Sept. 24. He was 75 years old. Mr. Maher began his railway career in 1871 with the Pittsburgh, Virginia & Charleston Railway, now a part of the Pennsylvania Railroad, and retired as president of the Norfolk & Western on April 30, 1924.

JOSEPH E. HUSTON, 67 years old, one of the founders of the Connersville Blower Co., Connersville, Ind., and president of the Lincoln Manufacturing Co. there, died recently after a brief illness.

FREDERIC R. WICKWIRE, vice-president and secretary of Wickwire Brothers, died at his home in Cortland, N. Y., Sept. 17.

Forthcoming Meetings

MACHINE TOOL BUILDERS EXPOSITION. Under the auspices of the National Machine Tool Builders Association, Sept. 30 to Oct. 4, in the Public Auditorium, Cleveland, Ohio. Ernest F. DuBrul, general manager, 1415 Enquirer Bldg., 617 Vine St., Cincinnati.

NATIONAL SAFETY COUNCIL. Eighteenth annual meeting, to be held in Stevens and Congress Hotels, Chicago, Sept. 30 to Oct. 4. William H. Cameron, 108 East Ohio Street, Chicago, is managing director.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Machine Shop Practice Division meeting in conjunction with the Production Division of the S.A.E. during the National Machine Tool Congress, Cleveland, Ohio, Sept. 30 to Oct. 4. Calvin W. Rice, 29 W. 39th St., New York, is secretary.

SOCIETY OF AUTOMOTIVE ENGINEERS. Production meeting at Hotel Cleveland, Cleveland, Ohio, Oct. 2 to 4. Coker F. Clarkson, 29 West 39th St., New York, is secretary.

GRAY IRON INSTITUTE—Annual meeting, Hotel Cleveland, Cleveland, Ohio, Wednesday, Oct. 16. Information may be obtained from Arthur J. Tuscany, manager, Terminal Tower Building, Cleveland.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Regional meeting, Akron, Ohio, Oct. 21 to 23. Calvin W. Rice, 29 W. 39th St., is secretary.

SOCIETY OF INDUSTRIAL ENGINEERS. Sixteenth national convention at Hotel Statler, Cleveland, October 23 to 25. Requests for programs should be sent to S.I.E. national office, 205 West Wacker Drive, Chicago.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION. Semi-annual fall meeting at the Benjamin Franklin Hotel, Philadelphia, October 24 to 26. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

BARS and shapes are down 5c. per 100 lb., to $1.90, on large tonnages from Pittsburgh mills. This is the first price recession of the year, on these materials. Production is declining at mills, with railroads doing the bulk of the buying. Automotive, construction, agricultural implement and pipe industries continue to take as much material as at this time last year. The mill decline has not as yet affected warehouse prices. With the exception of a slight recovery in antimony at Cleveland and slab zinc in East St. Louis, trading in non-ferrous metals continues dull.

(All prices as of Sept. 27, 1929)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$17.69@$18.19
Northern Basic	19.90
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	19.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00@14.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.26@21.76
Virginia No. 2	24.04
Basic	19.75@20.25
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20.26
Basic	20.26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.35	3.30	3.90†
No. 12	2.15@2.25	3.45	3.35	3.95†
No. 14	2.25@2.35	3.55	3.45	4.00†
No. 16	2.35@2.45	3.65	3.55	4.10†
Black				
Nos. 18 to 20	2.65	3.85	3.70	3.80
No. 22	2.80	4.00	3.85	3.95
No. 24	2.85	4.05	3.90	4.00
No. 26	2.95	4.15	4.00	4.10
No. 28	3.10	4.75	4.15	4.25
Galvanized				
No. 10	2.80@2.90	4.20	4.05	4.05
Nos. 12 to 14	2.90@3.00	4.30	4.15	4.15
No. 16	3.00@3.10	4.40	4.25	4.25
No. 18	3.15@3.25	4.55	4.40	4.40
No. 20	3.30@3.40	4.70	4.60	4.55
No. 22	3.35@3.45	4.75	4.65	4.60
No. 24	3.50@3.60	4.90	4.75	4.75
No. 26	3.75@3.85	5.15	5.00	5.00
No. 28	4.00@4.10	5.40	5.25	5.25

*Light plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Interral	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

Thickness—B.w.g. and Decimal Fractions		Outside Diameter in Inches—Price per Foot ¼	⅜	½	⅝	1	1¼	1½
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	34

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.60	3.65	3.60
Cold drawn, flat or square‡	4.10	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.30†	3.00	3.00
Soft steel bar shapes	3.30†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.25	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse— $\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{4}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			19.25
Tin, Straits, pigs, New York			47.50@48.50
Lead, pigs, E. St. Louis	6.70	New York	7.62½@8.12½
Zinc, slabs, E. St. Louis	6.80	New York	7.75@8.25

	New York	Cleveland	Chicago
Antimony, slabs	11.00@11.50	11.75	14.50
Copper sheets, base	27.75	27.75	27.75
Copper wire, mill, base	20.12½	20.12½	20.12½
Copper, drawn, round, base	26.25	26.25	26.25
Copper tubing, base	29.25	29.25	29.25
Brass sheets, high, base	23.25	23.25	23.25
Brass tubing, high, base	28.25	28.25	28.25
Brass rods, high, base	21.25	21.25	21.25
Brass wire, high, base	23.75	23.75	23.75

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.50@11.00	11.70	10.11
Solder (½ and ½).....	33.00	32.75	31@34
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			64.00
Commercial genuine, intermediate grade.....			48.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt.....			12.00

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	53.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity offered for sale:

	New York	Cleveland	Chicago
Crucible copper.....	15.50 @15.75	13.50	13.00 @14.00
Copper, heavy, and wire..	14.75 @15.75	13.00	12.00 @13.00
Copper, light, and bottoms	13.00 @13.50	12.50	11.00 @12.00
Heavy lead.....	5.62½@ 5.87½	6.25	4.75 @ 5.25
Tea lead.....	4.00 @ 4.25	4.25	3.75 @ 4.25
Brass, heavy, yellow.....	8.50 @ 9.00	8.00	8.00 @ 8.50
Brass, heavy, red.....	12.00 @12.50	12.50	11.75 @12.25
Brass, light.....	7.25 @ 7.75	7.50	7.00 @ 7.50
No. 1 yellow rod turnings.	9.75 @10.25	9.00	9.00 @ 9.50
Zinc.....	3.25 @ 3.50	3.25	3.00 @ 3.25

TIN PLATES—Charcoal— Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.†	.16	38.00 per M	.16
Sal soda, per lb.....	.02½	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.166	....	.173
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.75	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.33	.36	.24
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt...	30%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*All waste in bale lots. †100-lb. bales.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.033	$0.033	$0.0325
Cold drawn shafting...	per lb..	.036	.036	.034
Brass rods.....	per lb..	.2125	.2125	.1725
Solder (½ and ½).....	per lb..	.33	.335	.34
Cotton waste, white...	per lb..	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	3.60	3.60	3.05
Lard cutting oil.....	per gal.	.75	.75	.65
Machine oil.....	per gal.	.33	.33	.30
Belting, leather, medium.....	off list..	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50–10%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper.....	$4.86	$4.29	$4.29
Emery cloth.....	22.93	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper.....	2.08	2.04	2.04
Cloth.....	3.60	3.59	3.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton.....	Connellsville, 2.65@2.75		
Coke, prompt foundry, per net ton.....	Connellsville, 3.75@4.85		
White lead, dry or in oil...	100 lb. kegs....	New York, 13.75	
Red lead, dry.....	100 lb. kegs....	New York, 13.75	
Red lead, in oil.....	100 lb. kegs....	New York, 15.25	

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, $\frac{7}{16}$-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$7.10
Cast iron welding flux, per lb., net.....	.40
Brazing flux, per lb., net.....	.80

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Mass., Boston—Bureau of Supplies & Accounts, Navy Dept., Washington, D. C. — machine tools and brass pipe at Navy Yard here.

Mich., Detroit — Leland Detroit Mfg. Co., 5680 12th St.—drill press and equipment.

Mich., Detroit—Wolverine Bolt Co., French Rd.—equipment for the manufacture of nuts and bolts for proposed 1 story 80 x 300 ft. factory on Grinnell St. Estimated cost $70,000.

Mich., Lansing—Fisher Body Corp., General Motors Bldg.—equipment for handling and finishing automobile bodies for proposed 2 story, addition to plant on Division St. Estimated cost $240,000.

Mich., Muskegon—Vento Steel Sash Co., 6th St. and Pennsylvania R.R.—miscellaneous equipment for light steel work for proposed steel sash factory on 6th St. Estimated cost $75,000.

Mich., Pontiac—Thompson Aernautical Corp., Union Trust Bldg., Cleveland, O.—lathe, drill press, etc. for proposed airport buildings. Estimated cost $300,000.

O., Columbus — Agricultural Dryer Corp., Hartman Farm, R. Carr, Mgr.—machinery and equipment including drill press, automatic machine, air compressor, etc. for the manufacture of dryers for plant.

Ont., Kingston — Bd. of Education, A. J. Meiklejohn, 264 Bagot St., Chn. — complete equipment for workshops for proposed 3 story, vocational and technical schools. Estimated cost $330,000.

Ont., Wheatley—Town, R. N. Epplett, Clk.—tapping machine ¼ to 2 in., etc.

N. Z., Auckland—New Zealand Government Railways—will receive bids until Oct. 28 for ten lathes, 6½ in. centers, 6 ft. beds, sliding surfacing and screw cutting hollow spindles, cone heads, belt drive; eighteen sensitive drills, light column type, capacity up to 3 in.; seven screwing machines, single head, one up to 1 in. Whitworth thread, four up to 1½ in. and two up to 2½ in., all die heads and preferably Landis type; twelve shaping machines, stroke 14 or 15 in., table traverse 15 in. horizontal, 12 in. vertical, table top 10 x 14 in. and height 13 in.; one mechanical hammer, upright, Helve type, weight of ram 200 lbs. suitable welding up to 3½ in. diameter; eleven punches and shears, hand lever type, to punch ⅞ in. holes in ⅝ in. plate, depth of gap from center of punch 43 to 44 in. and cut flat iron ⅝ in., round and square iron 7/16 in., angle and tee iron 2 in. by 3/16 in., length of knives 2⅞ in.; nine squirrel cage electric motors, six 5 hp. and three 10 hp.

Opportunities for Future Business

Calif., Brawley—H. P. Wilkie Machine Shop, 168 East St., plans a 1 story, 50 x 75 ft. machine shop on E. St.

Calif., Burbank — Northrup Aircraft Corp., awarded contract for the construction of a 60 x 180 ft. factory, 50 x 60 ft. office, etc., at United Airport.

Calif., Los Angeles — D. M. Longyear, Inc., 7026 Hollywood Blvd., had plans prepared for a 1 story, 100 x 240 ft. garage on Sunset Blvd. Estimated cost $10,000. Parkinson & Parkinson, Title Insurance Bldg., Archts.

Fla., Pensacola — Newport Co., J. H. McCormack, Pres., plans the construction of a plant for the manufacture of insulating boards. Estimated cost $1,000,000.

Ill., Chicago—Faith Mfg. Co., 2531 North Ashland Ave., awarded contract for a 2 story, 120 x 145 ft. factory for the manufacture of die castings at Thorndale and Crawford Aves. Estimated cost $65,000. Noted Sept. 19.

Ill., East St. Louis—St. Louis Air Transport & Terminal Co., c/o Transcontinental Air Transport Inc., 915 Olive St., St. Louis, Mo., awarded contract for the construction of an airport including hangars, administration building, shops, etc. here.

Ind., Kokomo—Firestone Tire & Rubber Co., South Main St., Akron, O., is receiving bids for the construction of a machine shop and service station at Union and Mulberry Sts., here. Estimated cost $75,000. Bishop, Knowlton & Carson, 312 North Meridian St., Indianapolis, Archts.

Ind., Lafayette—Horat Machine Co. awarded contract for the construction of a 1 story, 60 x 100 ft. factory. Estimated cost $49,100.

Mass., Abington (sta. North Abington) — Anglo-American Textile Machinery Co., is having plans prepared for two additional units, 1 story, 40 x 100 ft. each on Centre Ave. Private plans.

Mass., Cambridge (Boston P. O.)—F. S. Payne Co., 75 Radcliffe Ave., awarded contract for a 2 story, 50 x 110 ft. addition to machine shop on Richdale St. Noted Sept. 19.

Mass., Chelsea (Boston P. O.)—Jenney Mfg. Co., 8 India St., Boston, is receiving bids for the construction of a 2 story garage, warehouse, pump house, etc. on Marginal St. here. Silsbee & Gould, 100 Amers Bldg., Boston, Engrs.

Mass., Dorchester (Boston P. O.)—S. Price, c/o Fink & Fink, 230 State St., Boston, Archts., is receiving bids for the construction of a 1 story, 50 x 115 ft. repair and service garage at 405 Columbia Rd., here. Estimated cost $45,000. Noted Aug. 29.

Mass., Leominster — R. D. Wass, c/o J. Bilzerian, 339 Main St., Worcester, is receiving bids for a 1 story, 50 x 120 ft. repair shop and service station, etc. at 39-59 Water St. Estimated cost $40,000. Noted Sept. 19.

Mass., Mattapan (Boston P. O.)—Owner, c/o M. W. Waters, 24 School St., Boston, Archt., will build a 1 story work shop at 59 Tremont St.

Mass., Somerville (Boston P. O.)—City, L. M. Conwell, Mayor, City Hall, is having plans prepared for a 3 story junior high school, including shops, etc. Estimated cost $400,000. F. I. Cooper Corp., 172 Tremont St., Boston, Archt.

Mich., Detroit — Koestlin Tool & Die Co., 3601 Humboldt Ave., awarded contract for the construction of a 1 and 2 story, 65 x 120 ft. building for addition to tool and die shop and office on Humboldt Ave. Estimated cost $55,000.

Mich., Detroit — McDonald Bros. Inc., 131 State St., Boston, Mass., is having plans prepared for a 6 story, 175 x 500 ft. engineering laboratory at Oakman Blvd. and Pennsylvania R.R. Estimated cost $3,000,000. Private plans.

Mich., Detroit — Timken Detroit Axle Co., Clark Ave., awarded contract for a 1 and 2 story, 80 x 320 and 80 x 115 ft. axle factory on Clark Ave. Estimated cost $125,000.

Mich., Lansing — Motor Wheel Corp., is having plans prepared for a 4 story, 130 x 275 ft. automobile wheel factory. Estimated cost $200,000. Private plans.

Minn., Morgan Park — Minnesota Steel Co., Duluth, will build a 125 x 150 ft. addition to mill here. Estimated cost $75,000.

Minn., St. Paul—Merchants National Bank and First National Bank, J. A. Oace, V. Pres., First National Soo Line Bldg., plan the construction of a 6 story garage on Minnesota St. Estimated cost $500,000. Graham, Anderson, Probst & White, 80 East Jackson Blvd., Chicago, Ill., Archts.

Miss., Meridian — City and Airport Comn., voted 75,000 bonds for the construction of an airport development including hangars, shops, etc.

Nev., Verdi—Jaksick & MacArthur, plan to rebuild planing mill destroyed by fire. Estimated cost including equipment $40,000.

N. H., Plymouth — Noyes Buick Co., 857 Commonwealth Ave., Boston, awarded contract for a 1 story, 60 x 150 ft. garage and repair shop. Estimated cost $40,000.

N. J., Maplewood—Kroydon Co., Burnett Ave., will receive new bids about Oct. 15 for a 1 story, 30 x 150 ft. addition to factory for the manufacture of golf clubs. Estimated cost $40,000. D. A. Hopper, 22 Ridgewood Ave., Irvington, Archt. Noted May 30.

N. J., Teaneck—Corp., c/o G. Swiller, 4215 3rd Ave., New York, N. Y., Archt., will soon award contract for the construction of garage here. Estimated cost $60,000.

N. Y., Long Island City—Honcar Corp., S. S. Caronsso, Secy., plans a 95 x 315 ft. addition to machine shop at Harris Ave. and Marion St. Estimated cost $40,000. Private plans.

N. Y., Long Island City—Warner Quinlan Co., 2 Park Ave., New York, will soon award contract for the construction of a service station, etc. at Vernon Ave. and 13th St. Estimated cost $130,000.

N. Y., New York — Adriatic Realty Corp., G. N. Brune, Pres., 505 Broome St., plans the construction of a 68 x 78 ft. garage at 110 Charles St. and 530 Hudson St. Estimated cost $40,000. P. Bardes, 239 Grand Ave., is architect.

N. Y., New York—National Biscuit Co., 85 9th Ave., awarded contract for the construction of a garage and shop at 415 West 16th St. Estimated cost to exceed $85,000.

N. Y., New York—H. Ratner, 507 5th Ave., plans a 2 story 100 x 150 ft. garage at Jerome Ave. and 176th St. Estimated cost $50,000. S. H. Kitzler, 358 Broadway, Archts. Maturity after Jan. 1. Noted Sept. 12.

N. Y., New York—W. E. Rodesta and L. A. Cuneo, 41 West 8th St., plan an 8 story, 67 x 99 ft. garage at 12 to 16 East 13th St. Estimated cost $110,000. W. Shary, 22 East 17th St., Archt.

N. Y., New York—Seventy East 11th St. Corp., H. Kay, Pres., 70 East 11th St., plans a 6 story, 42 x 94 ft. garage at 68 East 11th St. Estimated cost $50,000. W. Shary, 22 East 17th St., Archt.

N. Y., Yonkers—New York Guild for Jewish Blind, 200 West 72nd St., New York, will soon award contract for the construction of a group of buildings, including work shops, etc., at Saw Mill River Parkway, here. Estimated cost $500,000.

O., Cleveland — Brown-Graves Co., D. G. Spaulding, Secy., 804 East 55th St., plans the construction of a lumber yard on Miles Ave. Estimated cost $75,000. Private plans.

O., Cleveland—City, R. L. Harding, Dir., is having plans prepared for a 1 story garage and repair shop at East 110th St. and Leurer Ave. Estimated cost $100,000. H. Kregelius, 604 City Hall, Archt.

O., Cleveland — Cleveland Railway Co., C. Stanley, Purch. Agt., Hanna Bldg., awarded contract for the construction of a group of buildings including garage, blacksmith shop and tool room at Superior Ave. and Lakeview Rd. Estimated cost $100,000.

O., Cleveland—Osborn Mfg. Co., 5401 Hamilton Ave., manufacturers of brushes and foundry equipment, is receiving bids for a 4 story, 49 x 106 ft. factory. Estimated cost $200,000. Austin Co., 16112 Euclid Ave., Archt.

O., Dayton—Delco Products Co., East First St., awarded contract for the construction of a 7 story, 67 x 135 ft. factory at Second and Madison St. Estimated cost $200,000.

Okla., Muskogee—De Camp Glass Casket Co., is having preliminary plans prepared for a 3 story, 75 x 150 ft. factory. Estimated cost $60,000. Architect not selected.

Ore., Portland—Henry Weinhard, Estate, 475 Burnside St., awarded contract for the construction of a 2 and 3 story, 100 x 180 ft. garage, etc., at Burnside and 12th Sts. Estimated cost $160,000.

Pa., East Pittsburgh—B. H. Prack, Martin Bldg. N. S., Pittsburgh, Archt., is receiving bids for a 34 x 63 ft. power plant and 60 x 90 ft. service building on Ardmore Blvd. for Westinghouse Electric & Mfg. Co.

Pa., Philadelphia—United Motor Service Co., c/o A. Kahn, Marquette Bldg., Detroit, Mich., Archt., will soon award contract for a 1 story, 150 x 260 ft. garage and service station at Hunting Park and Germantown Ave. Estimated cost $200,000.

Pa., Pittsburgh—Argonant Realty Corp., Div. of General Motors Corp., H. G. Hickey, in charge, Research Bldg., Detroit, Mich., awarded contract for a 1 and 2 story, 146 x 218 ft. service building at Braddock St. and Thomas Ave. Noted Sept. 12.

Vt., St. Johnsbury—Dwight Motor Corp., is receiving bids for a 2 story, 110 x 135 ft. service building. Estimated cost $50,000. A. W. Osberg, 50 Manchester St., Manchester, N. H., Archt. Noted Sept. 19.

Ont., Oshawa—General Motors Co. of Canada, Ltd., 210 Spadina St., Toronto, plans a 3 story extension to present parts and service building here.

Ont., Oshawa — Skinner Mfg. Co. Ltd., Gananoque, awarded contract for the construction of a 1 story, 127 x 416 ft. factory for the manufacture of automobile accessories and bumpers here. Estimated cost $300,000. Noted July 25.

Ont., St. Catharines — McKinnon Industries Ltd., subsidiary of General Motors Co. of Canada, awarded contract for a 1 story, 120 x 480 ft. addition to motor accessory plant. Estimated cost $175,000.

Ont., Toronto—Dominion Wheel & Foundries, 131 Eastern Ave., plans the construction of a 1 story machine shop. Estimated cost $75,000. James, Proctor & Redfern, 36 Toronto St., Engrs.

Ont., Toronto—Hubbard Portable Oven Co. of Canada, Ltd., 1100 Queen St., plans the construction of a plant. Estimated cost $150,000.